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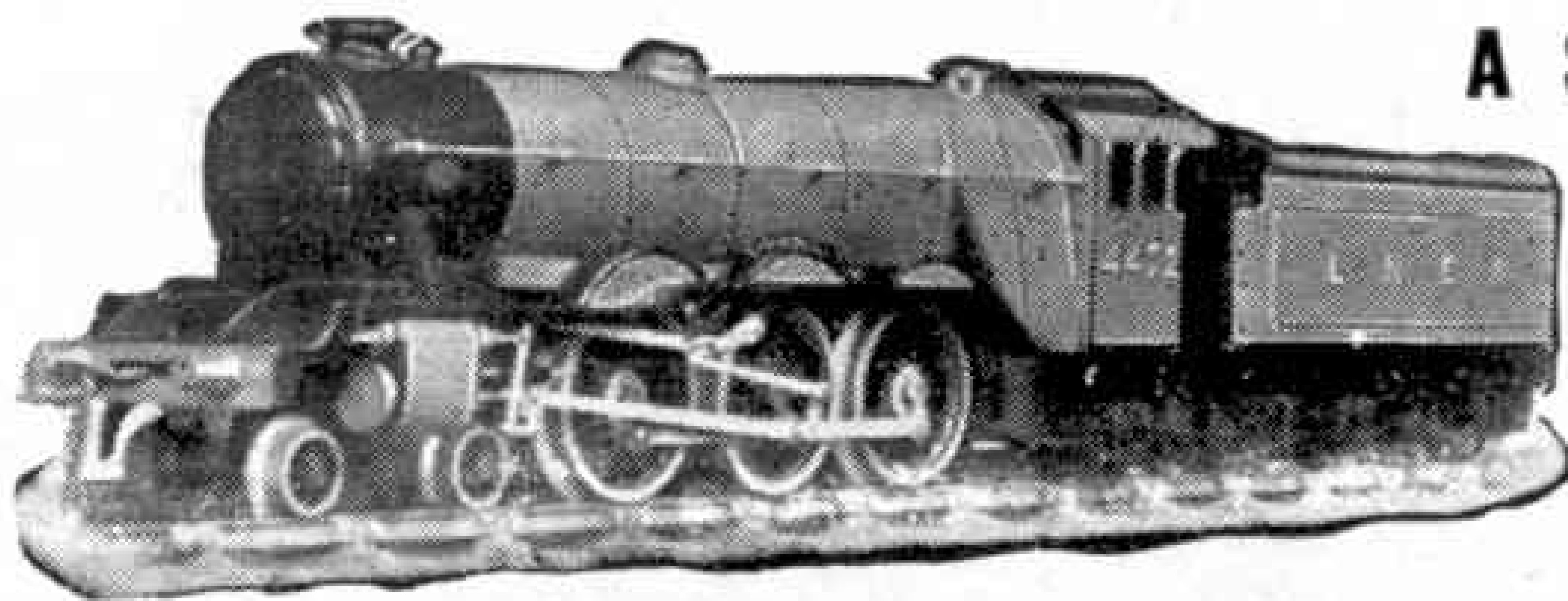
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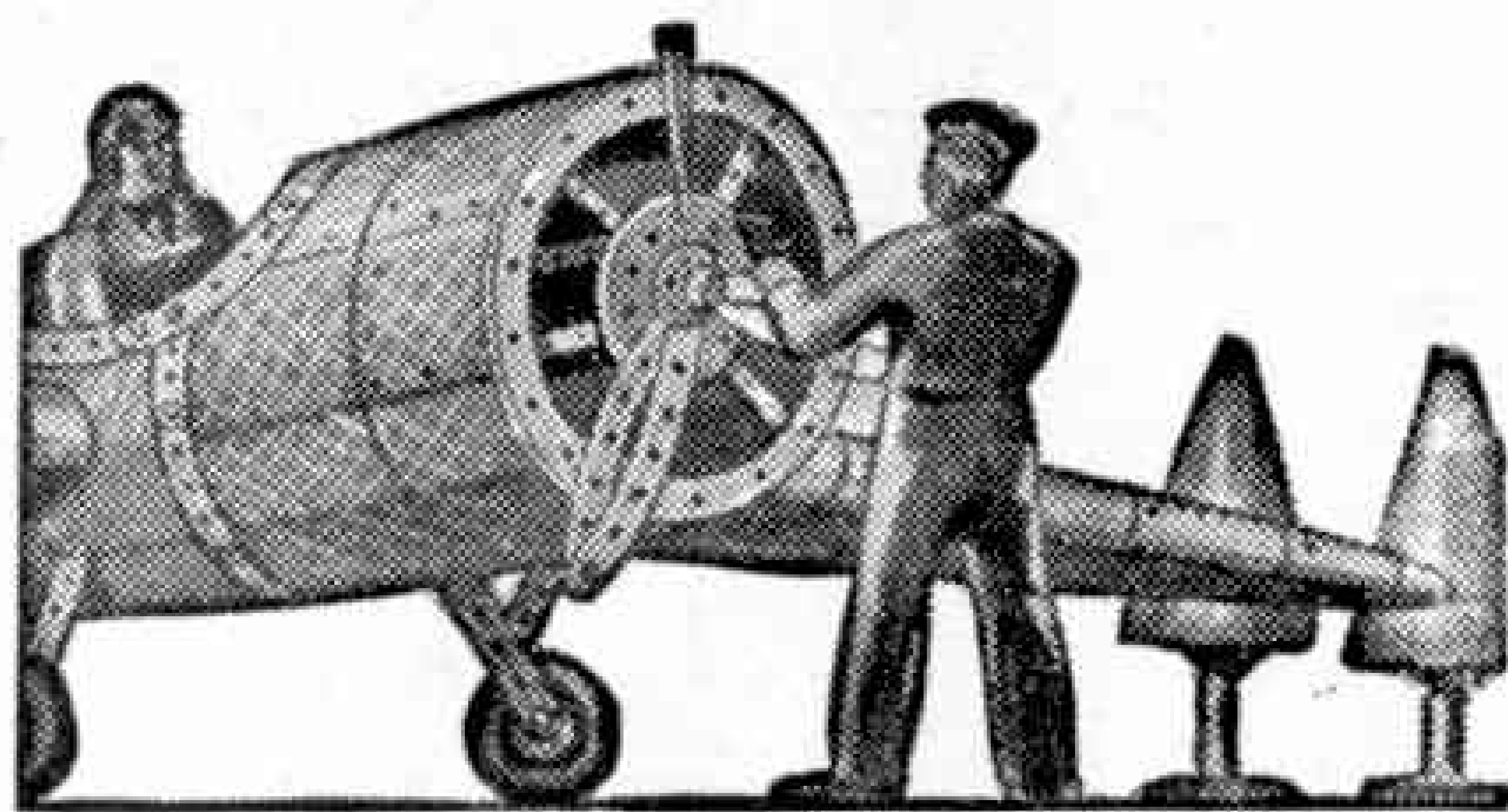
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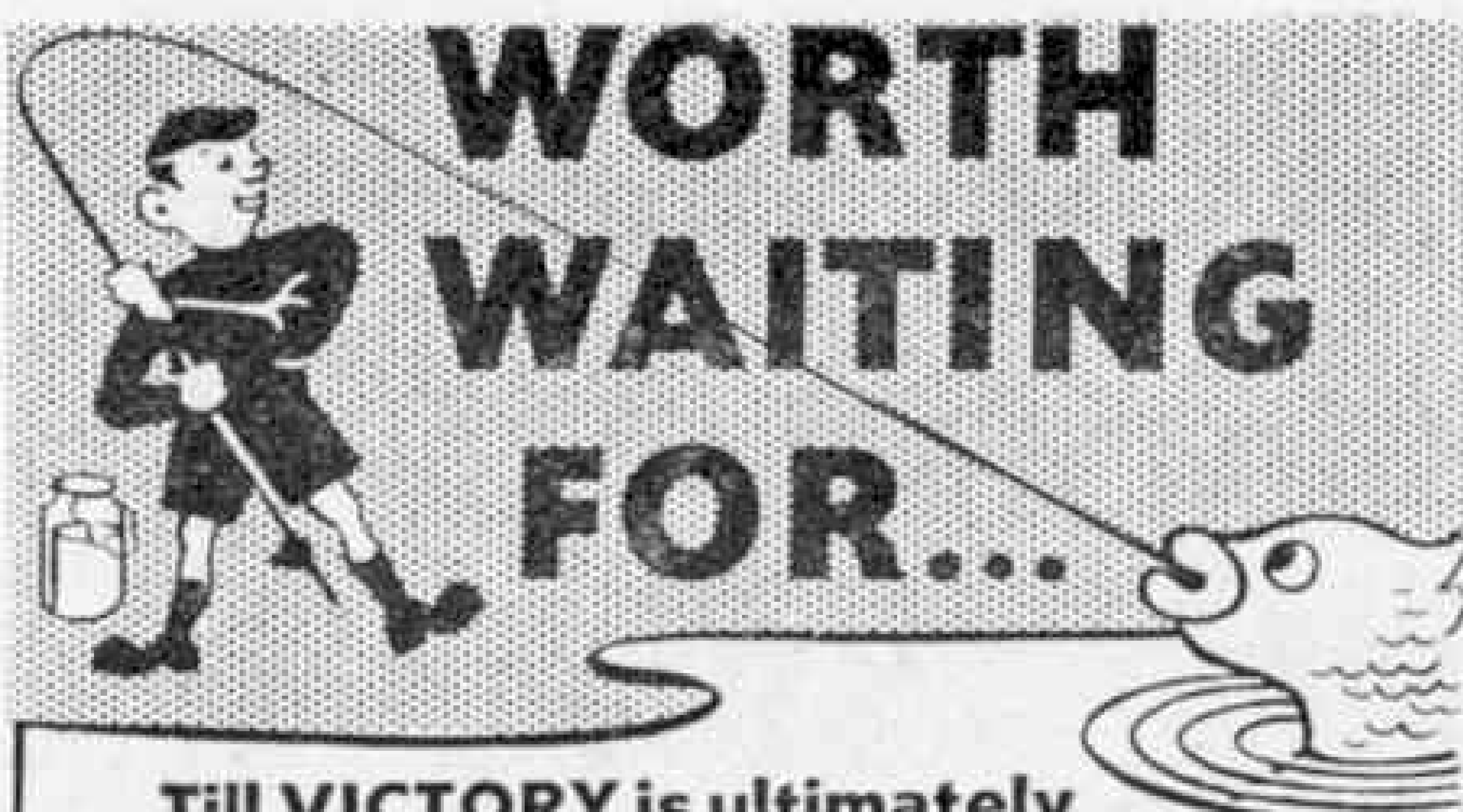


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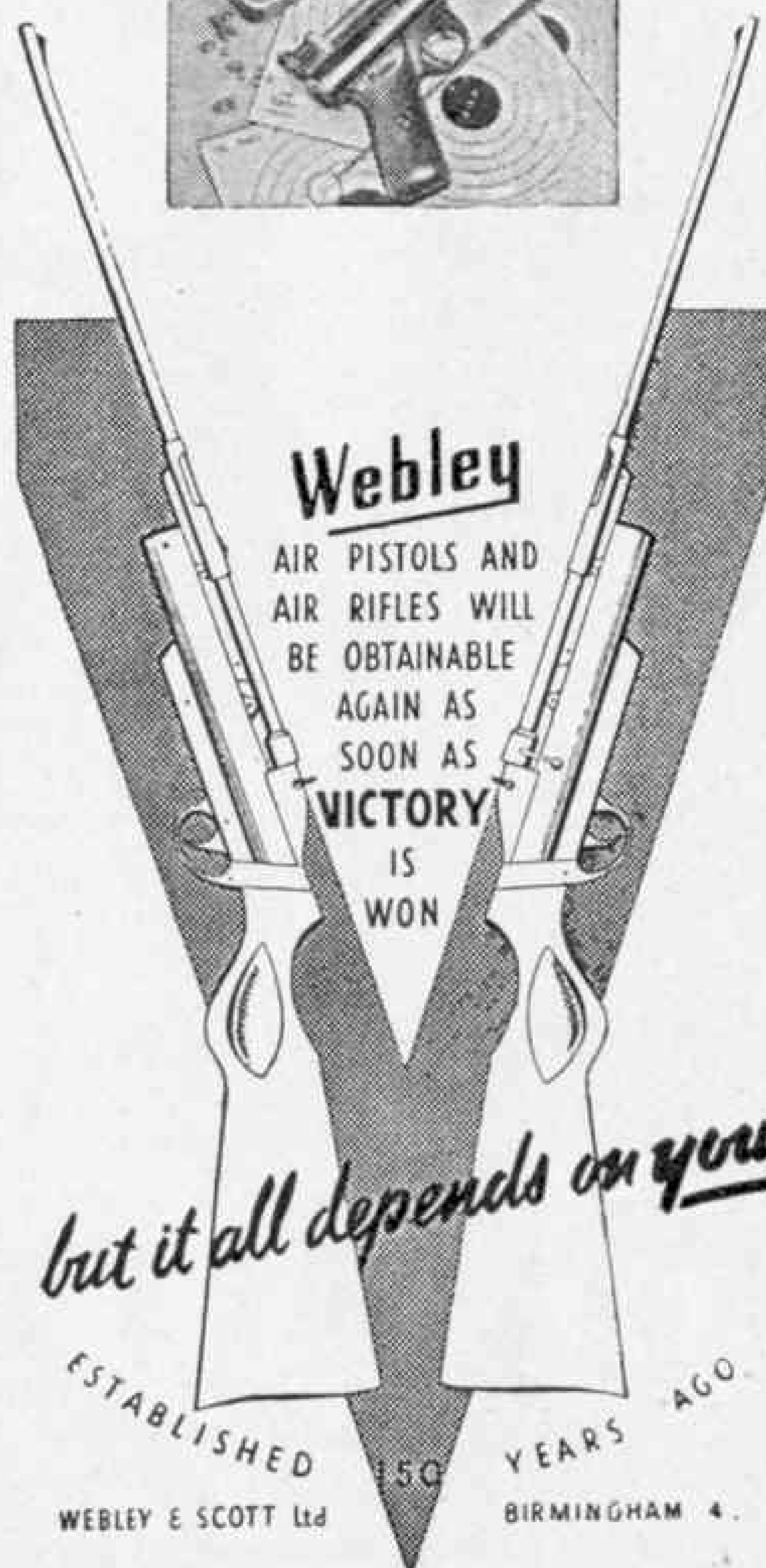
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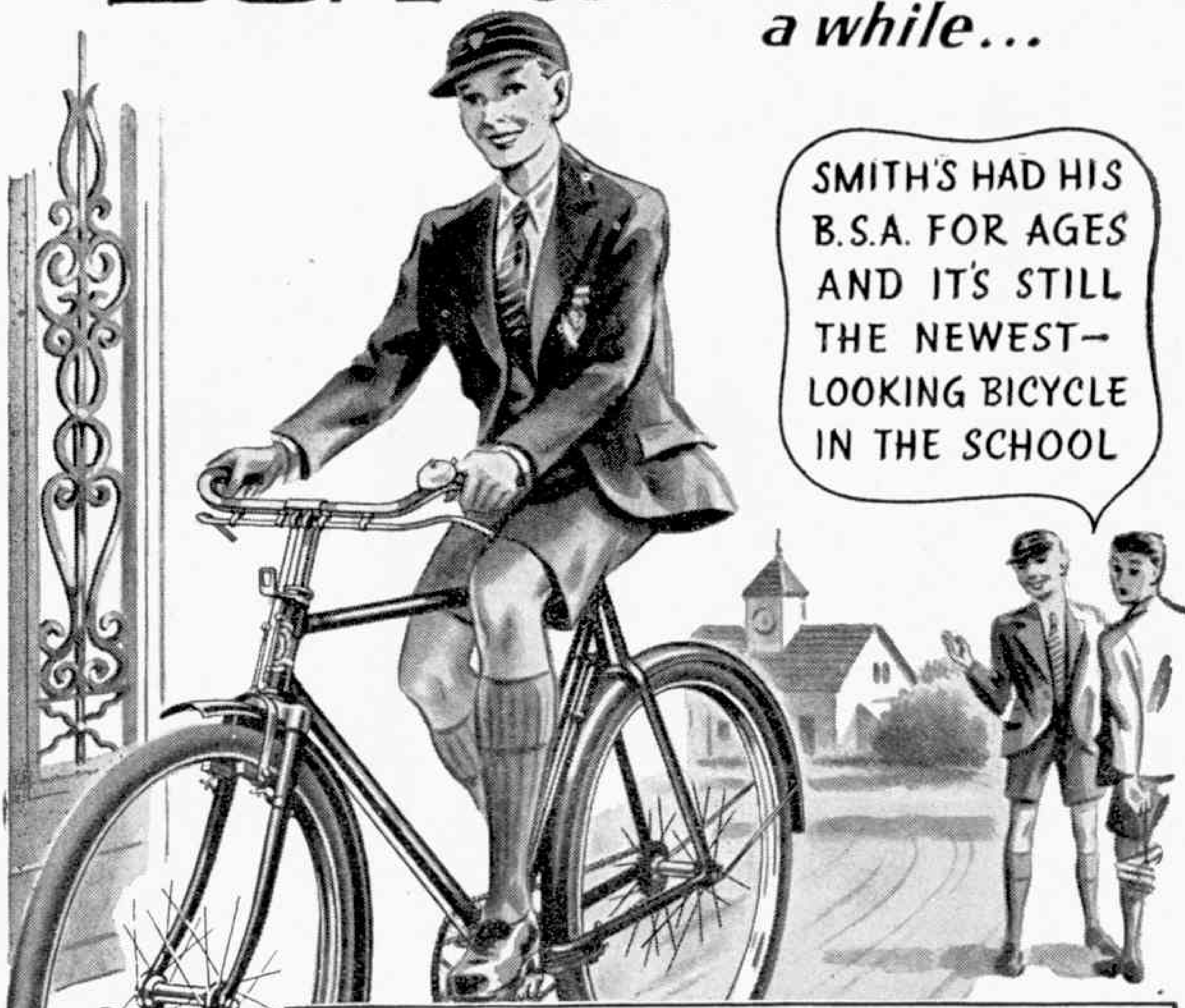
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MECCANO

MAGAZINE

Editorial Office:
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Vol. XXVII
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June 1942

With the Editor

An Aircraft Memory Test

I have been greatly interested in the results of memory tests of makes of cars published in our contemporary "*The Autocar*." The idea was to write down as many names of makes of cars as possible in the space of exactly one hour, and one reader succeeded in getting down 203 makes in the allotted time! It occurs to me that "*M.M.*" readers might like to try their hands at similar memory tests with makes of aeroplanes of the Allied nations. I do not offer any prizes, but I shall be very glad to see lists sent in, and to publish the most successful one. The lists should of course include both past and present makes, and civilian machines as well as fighters, bombers and other wartime craft.

To place the test on a clear basis I suggest the following conditions: 1. The names to be those of makes, not of individual types. For instance, "Bristol" would be included, but not "Beaufort," "Blenheim," "Bombay," etc. 2. Only makes of the Allied nations to be included. 3. The list to be made out from memory, without the use of any reference books, in exactly one hour.

Our Harmonica Fund

The "*M.M.*" fund to provide harmonicas for the R.A.F. has now reached over £15, and I intend to close it at the end of this month and to publish the list of contributions in the July "*M.M.*" I think even this modest sum should provide enough harmonicas to cause a definite disturbance of the atmosphere somewhere!

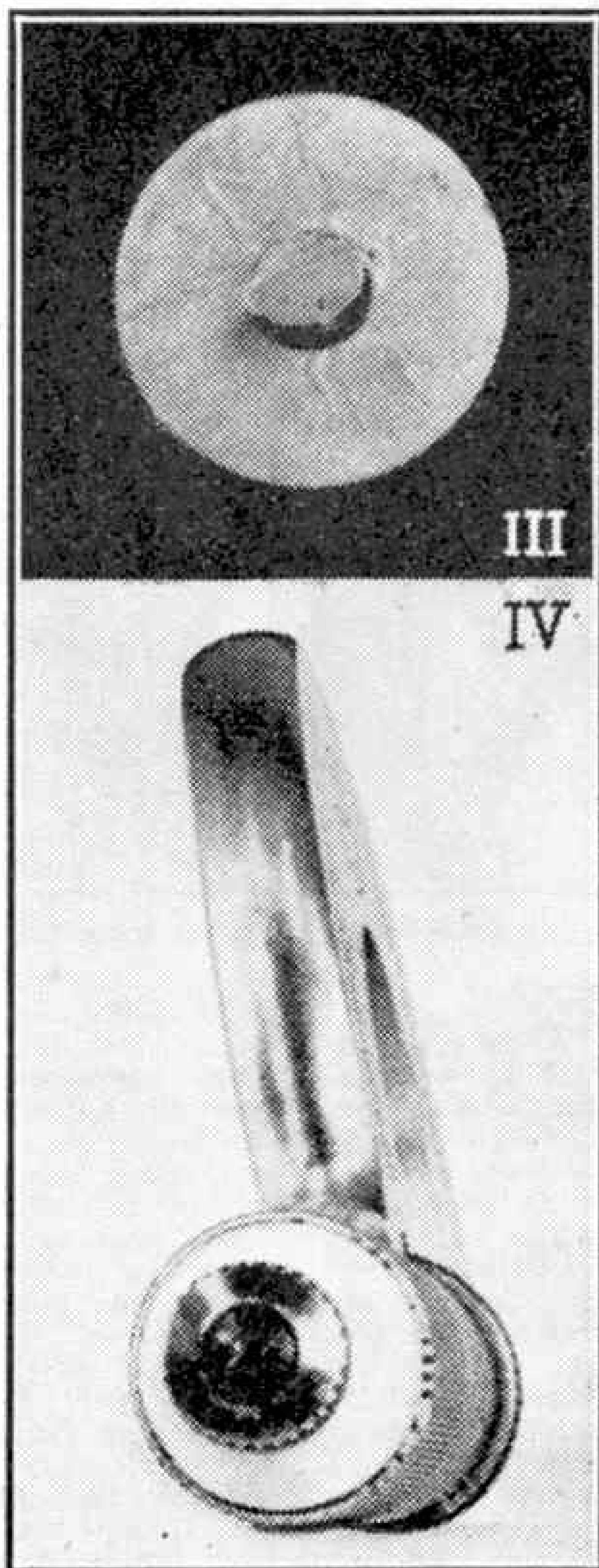
My correspondence shows that readers are anxious to keep on doing their bit to help in one way or another, and I shall be glad to receive suggestions for a new fund. This should be one to provide comforts of some kind, or something definitely useful, for one of the Services or for the Mercantile Marine. Send in your suggestions as soon as possible so that I can select the one that appears to be most popular and announce the choice in an early issue.

* * *

Here are the next two Puzzle Pictures; I wonder what luck you will have with them! The last two will appear next month when full instructions to competitors will be announced.

* * *

Our July cover will show a fine picture of the "*Yorkshire Pullman*."



June Puzzle Pictures Nos. III and IV.

This War and 1914-18

Some Contrasts on the Battlefield

By Capt. J. E. A. Whitman

INVENTION and development are so rapid in the twentieth century that the up-to-date things of 25 years ago now seem nearly as old fashioned as those of the days of the first Georges, and in nothing is this more noticeable than in warfare.

Tommy Atkins in his campaigning kit of 1914 did not look greatly different from his appearance at Aldershot, or even at the Royal Tournament at Olympia except where display items required the old-fashioned scarlet and gold. He still went to war in a smart peaked cap—which, however, a few weeks in the trenches soon altered—and seemed to have a good deal to carry, what with pack, haversack, waterbottle, rifle and bayonet, ammunition and entrenching tool. For years experts tried to reduce this impedimenta, but as fast as they succeed in eliminating something, the next war makes something else necessary. So, by 1939, Tommy had collected a steel helmet, a gas mask, special anti-gas capes and other sundries to add to his weight of

charges in which the enemy felt the deadly effect of the aforesaid sabres and lances. As one German cavalry officer said, after such an encounter: "They cut us Hussars to pieces." But after that, in the West, the new conditions of war gave no chance to the old cavalry tactics. On several occasions the brigades with their horses were brought up in order to exploit a hoped-for "break-through," which, however, never occurred; and most of their services were dismounted.

In Egypt and Palestine, however, the cavalry had many a spectacular operation to its credit, fought on the old classic models; and the Turks found good reason to fear the British horsemen. Lord Allenby, the Commander in Chief, himself a cavalryman, knew how to use them with telling effect.

To-day, the Lancers are recorded as having covered the flank of divisions retreating to Dunkirk; Hussars and Dragoons are often mentioned for their splendid work in Libya and elsewhere. But their steeds are

now the light armoured cars and light tanks; and when a Dragoon greets a Hussar it is no longer a helmet, busby or shake he throws back, but a steel cupola lid that he raises!

The day of the horsed fighter cannot be said to be entirely over, however. On the Russian fronts the Soviet marshals have made great use of horsed cavalry, and the modern Cossack, attacking in traditional style, has been responsible for more than one German rout.

Tanks of all kinds, shapes and sizes are pretty well known to us all to-day. How odd the early tank looks when compared with them. Here is one of the 1916 pattern being inspected by King George V; it

looks rather like an exaggerated cough lozenge placed on its side. But they did great things in their day. Their first appearance on the Somme startled the enemy; and when in November 1917 we opened the battle of Cambrai with an attack by 476 tanks we taught him a lesson that he has, unfortunately, remembered all too well, and in fact improved upon.

The mechanisation of all armies had made great strides by 1939, although in this matter, as in many others, the Germans proved to be in advance of everyone else. Even so the first figures were striking. The B.E.F. of 1914 included some 270 motor vehicles; that of 1939 no less than 25,000. And this progress brought in its train an enormous increase in the speed of things—not merely the transport of armies but their movements in actual battle.

In the last war, when the defence lines had extended from the Belgian coast to the Swiss frontier, operations were a sort of prolonged siege. The first lines were improved, supports dug, strong points added; then saps would be pushed towards the enemy lines,



A Tank of 1914-18. King George V leaving it after inspection.

responsibility.

Although a certain amount of the Army's heavy transport was carried out by lorries in 1914, for most purposes the horse still held pride of place. All except the heaviest guns were horse drawn, and thundered into battle right up to the end of the war—that is when movement was possible—much as they had done for a couple of centuries. The 18 pdr. field gun and the 4.5 in. field howitzer then constituted the main armament of the British Army; the use of heavier pieces on an extensive scale was a lesson we had yet to learn from the Germans.

The British cavalry, always the terror of Britain's foes, went to war in 1914 not, certainly, in plumed helmet and plated cuirass, but armed with the flashing sabre and the deadly lance ornamented with its joyous pennons. For a few brief weeks on the Western Front they were in their old element; the 18 cavalry regiments there had a busy time, first feeling the enemy's strength, then breaking several of his attacks at Mons and elsewhere by dashing

and sometimes mines exploded as a preliminary to a "trench raid," which usually resulted in a gain of a few yards of ground and a few prisoners. And major battles became nearly as tedious. The Battle of the Somme opened on 1st July 1916, after a preliminary bombardment that had lasted continuously from 24th June. As admitted afterwards by many German officers, this did have a deadly effect on the morale of the German infantry holding their lines; the fire interrupted reliefs and the supply of rations, besides wreaking great havoc. On the first day of the attack our infantry went forward under a series of protective barrages and counter battery fire which used up no less than four millions of shells of all sizes.

Yet this terrific fire did not destroy the enemy's concreted machine-gun posts and strong points, and in many cases the wire entanglements remained intact, causing us very heavy casualties. The terrific rain of shells had converted the ground into a honeycomb of holes over which movement under the most placid conditions was painfully slow. And, after five days of continuous attack, we had thrown the enemy back on a front of six miles, capturing four villages and some elaborate fortifications—to a distance of *one mile!*

The essence of the tactics of the Nazis was to move too fast to allow time for the other side to hold or throw up defensive works, and to go round them rather than go at them. A position encountered would of course, be engaged—to pin the defenders to it; but meantime motorised units would make wide detours and, striking at any detachments met with, come together miles behind the position itself. They sometimes moved back and attacked its supports from the rear. The defenders, in almost every case, concluded that not merely they but their comrades also were surrounded, and gave up the struggle. By these methods, in the five days 15th-19th May 1940, the Germans crossed the Meuse from Sedan northward and reached Rethel, about 40 miles away, causing a dangerous "bulge" in the Allied line. By 21st May they were in Abbeville and Amiens, nearly 200 miles advance in seven days; and the Allied armies were split in two, never to be re-united.

Although many other factors contributed to this outstanding success, the German mastery of the technique of co-ordinating the speed and fighting capabilities of the aeroplane with that of motorised units on the ground must be considered as decisive. It should, however, be remembered that the Allies had nothing like a sufficiency of either to oppose the German attacks. In other and later fields, where both sides were more or less well equipped in this respect and employed similar tactics, the course of battles was different.

The mobile battles in the wide desert spaces of Libya bear a great resemblance to battles at sea. There is no fixed line, in the old sense of the term; a series of points in an area of considerable depth are the objectives of attack and defence, and an engagement may range over distances of 50, 60, or even 100 miles in a day. Generally, the moment an attack is opened, corresponding forces on the other side engage the "spearhead"—that is the columns of tanks launched;

and tank fights with tank manoeuvring at high speed very much as cruisers or destroyers do. Meanwhile, the attacker seeks to rush other forces past the area of the first conflict to cut in on the opponent's rear, or possibly to seize his dumps and strong points defending his bases. The major town which in despatches figured as being the object of the operation was often "by-passed"; if the attack succeeded, it could be attended to later on. In this way, in the



British Tommies of 1914-15 in campaigning kit, with a Horse Guards sentry (dismounted).

campaigns of Generals Wavell and Auchinleck against General Rommel, battles swung to and fro past Tobruk.

In closer country, such as Malaya and Burma, motorised fighting vehicles have been more restricted in their movements and frequently have to keep to roads and tracks which, to some extent, has aided the defender. But in place of the swift flank movements of light vehicles, the enemy devised another method of trying to achieve the same result, which has become known as "infiltration."

Small parties—not more than four or five men as a rule—specially picked for their agility as well as their skill at arms, were sent forward carrying sub-machine guns, a light mortar and bombs, and pistols and hand grenades. Their work was to get through the front line of the defence somehow—one by one, perhaps—and keep going without disclosing their presence until they were well in rear. In Malaya many of the Japanese moved long distances by merely passing from one tree top to another! Arrived at a suitable spot, they would ambush the first small enemy party encountered, preferably one with transport; and now and then a Bren Gun Carrier with its guns and ammunition fell to the infiltrators. Thus reinforced they would move about the roads and into villages, spreading dismay and terror among the population and uneasiness in our lines of communication. The Japanese success was aided by the fact that many Malaysians were armed and fighting in irregular units on our side, and it was often difficult to distinguish (Continued on page 230)

Madagascar

A Fascinating and Mysterious Land

By Harold J. Shepstone, F.R.G.S.

MADAGASCAR, which has suddenly been brought within the war zone, is in many respects a fascinating and mysterious land. Little is known concerning the early history of the island. No one knows for certain whether its people come from nearby Africa or distant Asia, and the flora and fauna also are remarkable.

Madagascar is the fourth largest island in the world, if Greenland is included. It is nearly three times the size of Great Britain; 960 miles long from north to south, over 300 miles wide, and with an area of 240,000 square miles. Its strategic importance as a naval and air base for protecting shipping in the Indian Ocean is obvious. It consists physically of three zones—first, a low-lying flat tract of coastline; next, a region of forest land, of grassy plains and of mountain slopes rich in food-producing trees; and last, a mountainous plateau from 3,000 to 4,000 ft. high, with mountains rising to 8,000 ft. and over, the highest peak being Tsaratanana, 9,450 ft. high. The low-lying coastline is inclined to be hot and moist, but the great central plateau enjoys a delightful climate and the air is invigorating.

The principal commercial port is Tamatave, on the east coast, a typical French colonial town. On the west coast are the ports of Tulear and Majunga, and at the extreme northern tip of the island is the naval base of Diego Suarez, now in British hands. It has one of the largest harbours in the world—big enough to shelter the combined fleets of the United Nations. It was only finished in 1935. There are 10 miles of quays and docks, and a dry dock capable of accommodating a 26,000-ton battleship. There are also an arsenal and a couple of air-fields. For 10 years the French spent money lavishly on this naval and air base, and it has not inaptly been termed the Singapore of the Indian Ocean.

Madagascar has a population of just under four millions. The French population number about 25,000, and in addition there are Chinese, Hindus and Malays. A few Japanese have entered the island in recent years, settling along the coast and apparently engaged in fishing and boat-building. The native population is divided into seven tribes, the most important and the most intelligent being the Hova, numbering just under a million. The origin of this tribe has long formed the subject of lively discussion among ethnologists. The general opinion is that they originally came from Malaya, or the Phoenician islands, and the darker-skinned and more backward tribes from Africa, probably brought over as slaves by the Arabs.

All the tribes are referred to under the general term of Malagasy. They speak one language though there are many dialects. It is closely allied to the Malay or Malaya-Phoenician tongue. By the orders of the Government French is taught in all the schools, but in the churches and missions all services are conducted in the native tongue.

While the well-to-do of both sexes in the principal towns and villages adopt European dress, the majority

of men and women of the middle and poorer classes wear the "*lamba*" over their ordinary clothes. This is a long shawl drawn round the shoulders with the longer end thrown artistically across the left shoulder and allowed to hang down at the back. As this garment is far more frequently white than coloured, the usual crowd in a market place is almost a mass of white.

The staple food of the Malagasy is rice, manico and other vegetables, with the usual tropical and sub-tropical fruits. They consume also a lot of pork, chicken, ducks and geese. They raise a great deal of cattle, and Madagascar is said to contain more cattle per capita than any other country. In the rural districts a man's social standing is indicated by the number of cattle he possesses. He prizes his cattle so much that he never slaughters them for food unless he is obliged. One curious custom is that



Diego Suarez, the naval base of Madagascar, now in British hands.

though the Malagasy is perfectly honest in all other matters, he is fond of taking his neighbour's cattle if he has the opportunity. He considers that quite legitimate, and it is not regarded as a crime.

The flora and fauna of the island have a special interest. The traveller's palm, really a gigantic banana, is a very noticeable landscape feature. It grows to a great height, 100 ft. and more. The name is derived from the fact that water collects in the large branches, and may be obtained by piercing the leaves near the stem. Many a traveller has had reason to bless the palm as it has been the means of saving his life. In the forest areas there are many beautiful and remarkable trees; flowering lianas hang in gay festoons, tree-ferns and fungi form a luxuriant undergrowth, while the varied colours and shapes of the foliage and lichens are enhanced by the gorgeous hues of beetles and butterflies and the brilliant plumage of many birds.

The largest wild animal found in Madagascar is the boar. This is remarkable considering the size of the island and its nearness to the African coast, which is only some 300 miles away. The most characteristic denizen of the forest is the lemur, of which there are many species. To the non-scientific observer it appears to be a mixture between a monkey and a squirrel as it makes its way through the forest, skipping and leaping from tree to tree, and uttering



Scene in the market place at Tananarive, capital of the island.

shrill, plaintive cries. Stranger even than the lemur is the aye-aye, an animal found nowhere else in the world. As it is a nocturnal creature and the Malagasy have a superstitious dread of it, little is known of its habits. Fossil remains have been found of a large extinct bird, "*Aepyornis maximus*," and also its eggs. The latter are six times as large as an ostrich egg, and one recently brought to Europe measured 12 in. in diameter and had a capacity of nearly two gallons.

Madagascar was discovered by the Portuguese navigator Diego Diaz in 1500. For the next 200 years it was the haunt of pirates who preyed upon the ships of the British East India Company. Their crews married native women and set up little robber kingdoms. Ruins of cannon-casting and gunpowder-making equipment can still be seen. King Charles I was interested in Madagascar and wanted to send out his nephew, Prince Rupert to rule it. The necessary funds, however, were not available for such an enterprise. By 1800 British influence was strong in the island and in 1811 the Congress of Vienna awarded Great Britain the settlements there, but the matter was allowed to drift.

The settlements were ceded to King Ramada I on his promise to give up slavery. He favoured the British. Their missionaries had introduced Christianity, opened schools and taught the natives useful crafts—weaving, raffia work of all kinds, pottery, tinware and lace-making, which is carried on to this day. British traders were also welcomed for their interest in the commercial possibilities of the land. Unfortunately Ramada I died at the early age of 36 as the result of fever. He had no son living, and nominated his nephew, Prince Rakotobe, who had been a scholar in one of the mission schools, to be his successor. One of Ramadas' wives, Ranavalo, had determined to secure the throne for herself, however, and at her instigation the young prince was foully murdered. Then Ranavalo came to the throne, and one of her first acts was to remove by death every member of the late king's family, as well as his trusted generals and faithful governors of the provinces.

Then she declared war upon the Christian community, her slogan being "Madagascar for the Malagasys." She kept a Frenchman, Laborde, a prisoner in the island because he was a clever mechanic and had an inventive mind of a high order. She prohibited religious teaching in the schools, closed the churches, and forbade the missionaries to preach. They had no option but to leave the country. She issued an edict to the effect that Christian worship was forbidden on pain of death.

Then followed a series of persecutions almost unparalleled in history; but instead of damping the ardour of the greater majority of the native Christians, these kindled it into a burning enthusiasm. The number of converts actually increased. They met secretly in one another's houses and held their services on the tops of mountains, sending out scouts who quickly warned them if any of Ranavalo's soldiers were about. Hundreds were arrested, beaten, thrown into prison, and not a few condemned to death. On one occasion Ranavalo caused some 3,000 Christian men and women and even quite young children, who had been hunted down by her soldiers, to be brought to the capital to hear their fate. Many were hurled to death from the edge of Ampamarinava, a rock to the west of the palace. Others were flogged, imprisoned or sold into slavery.

The queen died in 1861, after a reign of 36 years, and she is referred to in the island as Ranavalo the Cruel. She was succeeded by Ranavalo II and Ranavalo III. The latter encouraged the return to Christianity, and the missionaries were allowed to come back. One third of the population to-day are Christians.

A few years later, in 1895, there was a rising by the Hova. The French, who had now begun to take a keen interest in the island, landed troops and conquered it. General Gallieni, who had seen service in French Indo-China, became the first Governor-General of Madagascar. At that time 93 per cent. of the commerce of the country was in foreign hands, 90 per cent. of the country was unexplored, and nearly all the subordinate officials spoke English. Gallieni was responsible for the building of 16,000 miles of



The palm fringed coast.

roads, and there are now over 500 miles of railways, all narrow gauge. Madagascar is a very rich land only very partially developed. The soil is fertile and hardly scratched. Rubber, gold, tin and graphite exist.

The capital, Tananarive, lies almost in the centre of the island, and is reached from the port of Tamatave by rail. It is a fascinating city, not only for its historical associations and commanding position, being built on two hills, but also for the strange contrast between the complete modernity of the French population with their motor cars, buses and lorries, the up-to-date shops and public buildings, and the Malagasy with their native dress, their deep-rooted tribal customs, and the filanzana, a kind of sedan chair.

Curtiss Fighters of the R.A.F.

WHEN the full story of the splendid part played by American aircraft in this war can be told, the achievements of the Curtiss single-seater fighters will have an important part in it. These machines were among the earliest American types in action against the enemy, and they had already done good work with l'Armée de l'Air when the collapse of France closed that chapter of their war-time history. Large numbers of additional Curtiss fighters in production for France were then diverted to Britain, and supplemented those ordered direct by this country.

These machines were Curtiss "Hawk" 75As, and in the Royal Air Force they were given the type name of "Mohawk," to which was added a number denoting which of the several versions of the 75A they were. The "Mohawk" I had a 1,000 h.p. Pratt and Whitney "Twin Wasp" engine that gave it a top speed of about 287 m.p.h., and the Mark II version a similar engine developing 1,200 h.p., which raised the top speed of the machine to about 300 m.p.h. Later modifications of the "Hawk" 75A, fitted with other types of engines, achieved slightly higher maximum speeds. In the U.S. Army Air Corps the several forms of the 75A were classed as the P.36 series, and they were followed by a further series developed from them and called in the Army Air Corps the Curtiss P.40s.

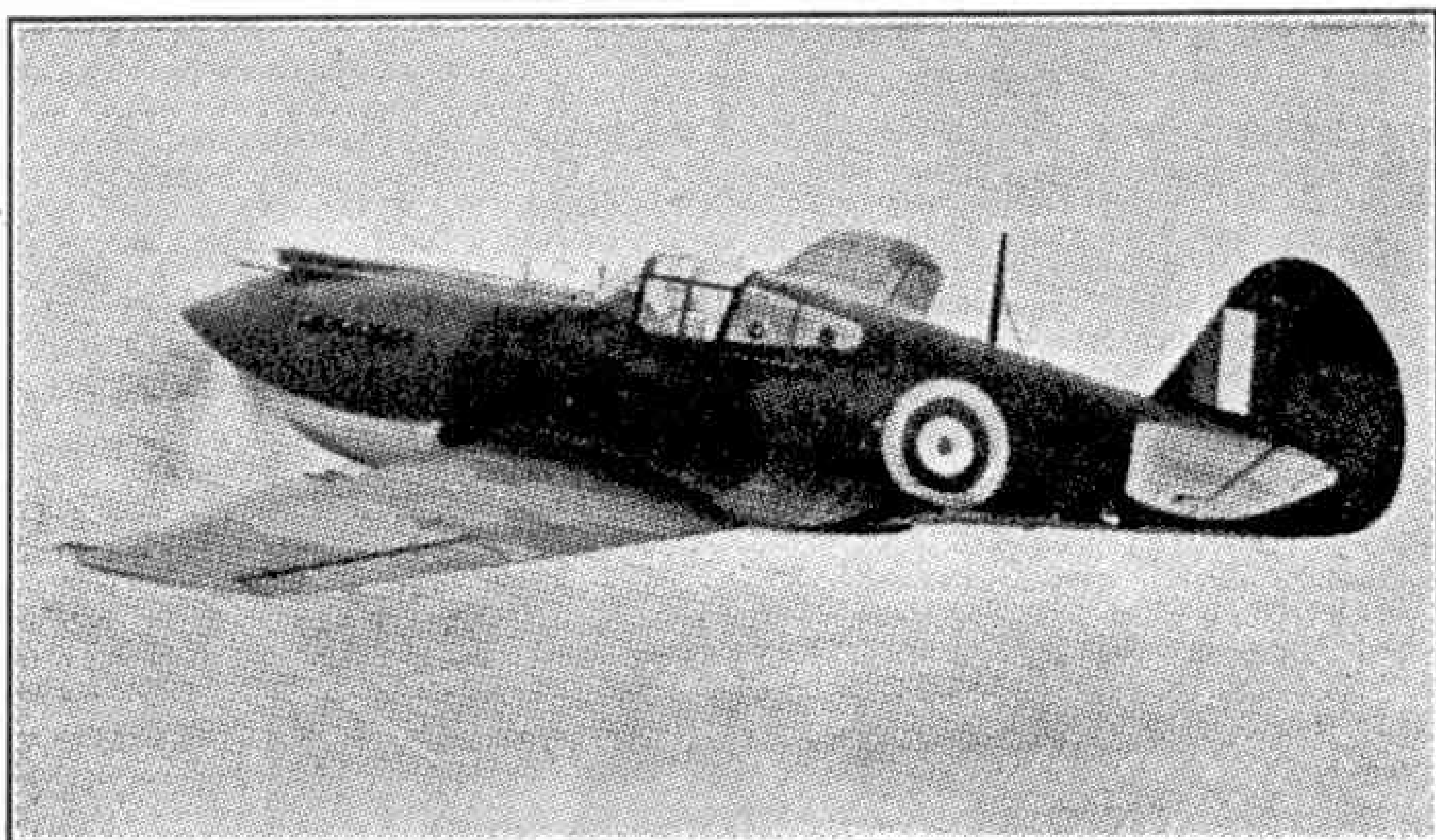
Thousands of these P.40 fighters have been produced, and as long ago as January 1941 the Curtiss firm were reported to be turning them out at the rate of eight per day. Big quantities have been delivered to the R.A.F., in which the early versions of the type are known as "Tomahawks" and the later ones as "Kittyhawks."

The fine work of the "Tomahawks" in this war has made them famous. They are not as fast as our "Hurricanes" and "Spitfires," but they have proved outstandingly successful in action, under desert warfare conditions, both in attacking the enemy in the air and in strafing aircraft on the ground at enemy bases. A fine example of their efficiency in these respects is that of a "Tomahawk"-equipped Royal Australian Air Force squadron in the Middle East, who brought down 18 enemy machines for every one of their own that they lost. "Tomahawks" also did very well in the Syrian campaign in 1941, again in the hands of R.A.A.F. pilots. No wonder therefore that Lieut. Col. Moore-Brabazon, when Minister of Aircraft Production, declared in a message to the Curtiss firm that "pilots tell me again and again how they relish the performance, the manoeuvrability, and the range of the 'Tomahawk,' and our successes against enemy fighters and bombers supply the proof." In addition to this good work in the Middle East, this type of Curtiss fighter has been in action with the R.A.F. on the Home front, and is being used by the American forces stationed in Iceland.

The "Tomahawk" was developed from the radial-engined "Mohawk," and was the first American aeroplane fitted with the Allison Vee type liquid

cooled engine to be delivered to the R.A.F. The machine has a top speed of 328 m.p.h. at 15,000 ft. It is a low wing monoplane of stressed-skin construction, with an enclosed cockpit set well back in the fuselage, and its range is given as 700 miles at 278 m.p.h. The "Tomahawk" I is the British version of the P.40A supplied to the U.S. Army Air Corps, and is armed with six machine guns, two of .50 calibre mounted in the engine cowlings and four of .303 calibre in the wings.

Research to increase still further the efficiency of the Curtiss P.40 goes on unceasingly, and improved versions have been put into production as they have been perfected. When the more powerful 1,325 h.p. Allison engine became available the design of the P.40 was revised to make it suitable for this engine, and the result was the P.40D, known in the R.A.F. as the "Kittyhawk." This version of the type first went into service in the Middle East last year. The "Kittyhawk" differs from the "Tomahawk" mainly



One of the Curtiss "Tomahawk" single-seater Fighters which are giving splendid service in the Royal Air Force and with Dominion air squadrons. Photograph reproduced from the "Curtiss Fly Leaf."

in having a fuselage nose improved by the absence of guns in the engine cowlings, a redesigned cockpit cover, a longer and deeper radiator, placed nearer to the nose, and, of course, a more powerful engine. Armament details are not available, but the fire power of the machine is believed to be about 25 per cent. greater than that of the "Tomahawk" I.

Since the first "Kittyhawks" went into service a still more heavily armed version, called in the U.S. Army Air Corps the P.40E, has been produced. It has a striking power $6\frac{2}{3}$ times greater than that of the P.36 fighter, and therefore is a formidable attacker. One of these P.40Es is shown on our cover this month, which is based on an illustration in the "Curtiss Fly Leaf," the journal of the Airplane Division of the Curtiss-Wright Corporation, U.S.A.

The latest addition to the rapidly growing range of P.40 fighters is the P.40F, which is of special interest as the first military aeroplane in the United States to be fitted with the new American-built Rolls-Royce "Merlin" engine, being manufactured by the Packard Motor Car Company. The P.40F is claimed to be "the hardest hitting plane yet built in U.S.A." Its armament is reported to give a fire power almost equal to that of five .50 calibre and ten .30 calibre guns, and its speed to be almost 400 m.p.h.

A New American Milling Machine

By Andrew R. Boone

THE time required to mill certain essential parts for the Lockheed "Lightning" interceptor fighter has been reduced from 90 hrs. to $2\frac{1}{2}$ hrs. by a new machine developed by the Lockheed Aircraft Co. and Onsrud Machine Works, in the United States. This is shown at work in the illustrations on this page. Its use effects a saving of $3\frac{1}{2}$ days in the production of each of these fast aircraft, which in the U.S. Army Air Corps are known as P-38s, and in the R.A.F. as "Lightnings." The machine is the first of its kind to be used in the aircraft industry.

The parts dealt with are tapering extrusions with cut-outs in the flanges and various other cuts designed to reduce weight. Until recently they were a problem with aircraft manufacturers, for owing to their length and awkwardness in handling it was impossible to put them on a conventional milling machine. The Lockheed Company set out to improve matters by having a machine specially built for this purpose. The extrusion miller, as the new machine is called, meets the needs of the aircraft manufacturers, and promises to be an important aid in the arms production of the United Nations.

The machine is 30 ft. in overall length,

with a cutting area 12 in. wide and 20 ft. long. The carriage travels on ways, and is driven by means of a rack and gear

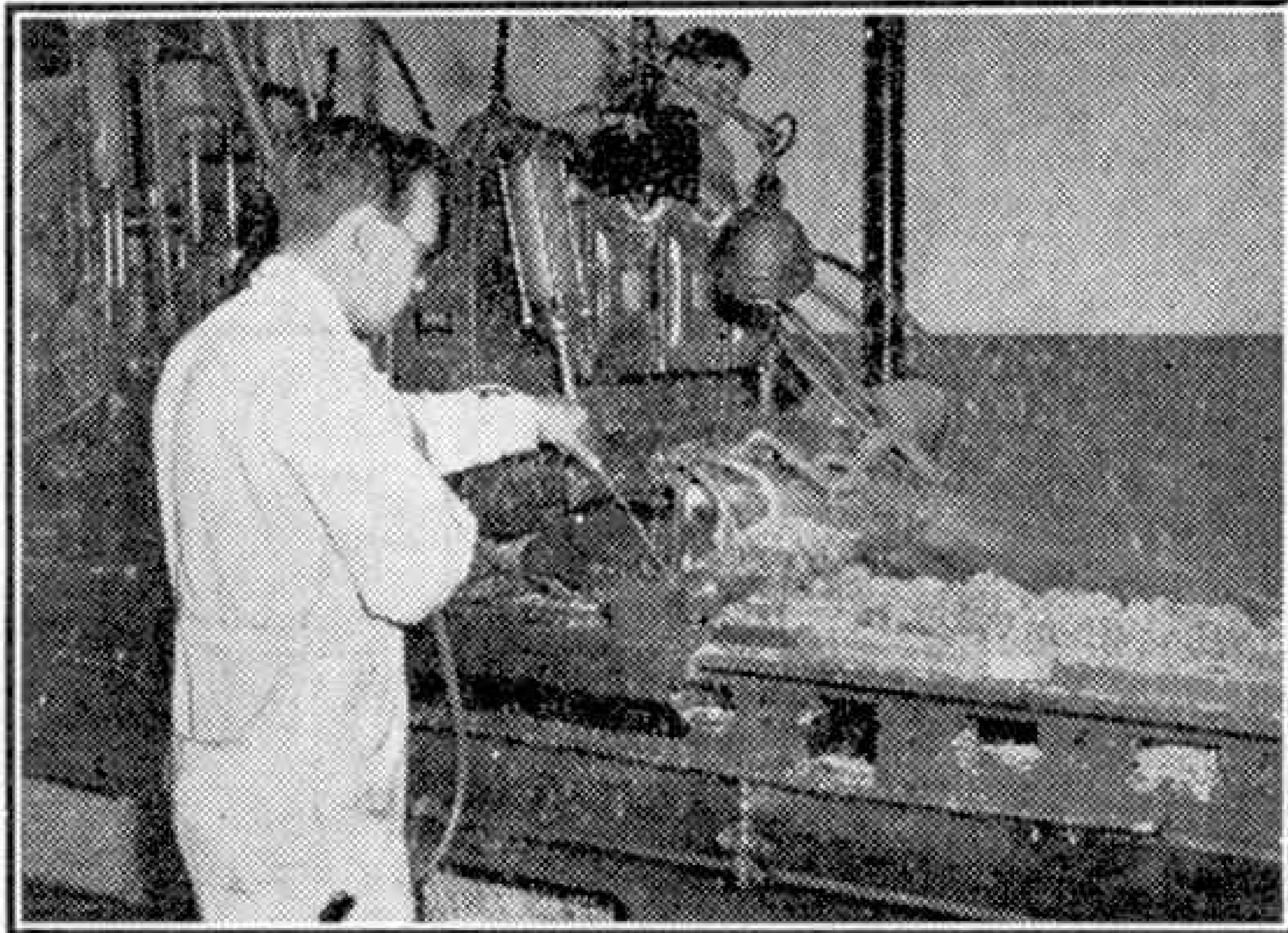
mechanism giving a feed range of 3 ft. to 18 ft. a minute in either direction. A platform is fastened on the back of the carriage, and on this the operator stands, about 15 in. off the floor, riding the carriage as it shuttles back and forth the full length of the extrusion on the mill.

Two helpers on the floor meanwhile feed the extrusions into the machine and keep the chips cleared away. The control panel is on the moving platform for use by the operator.

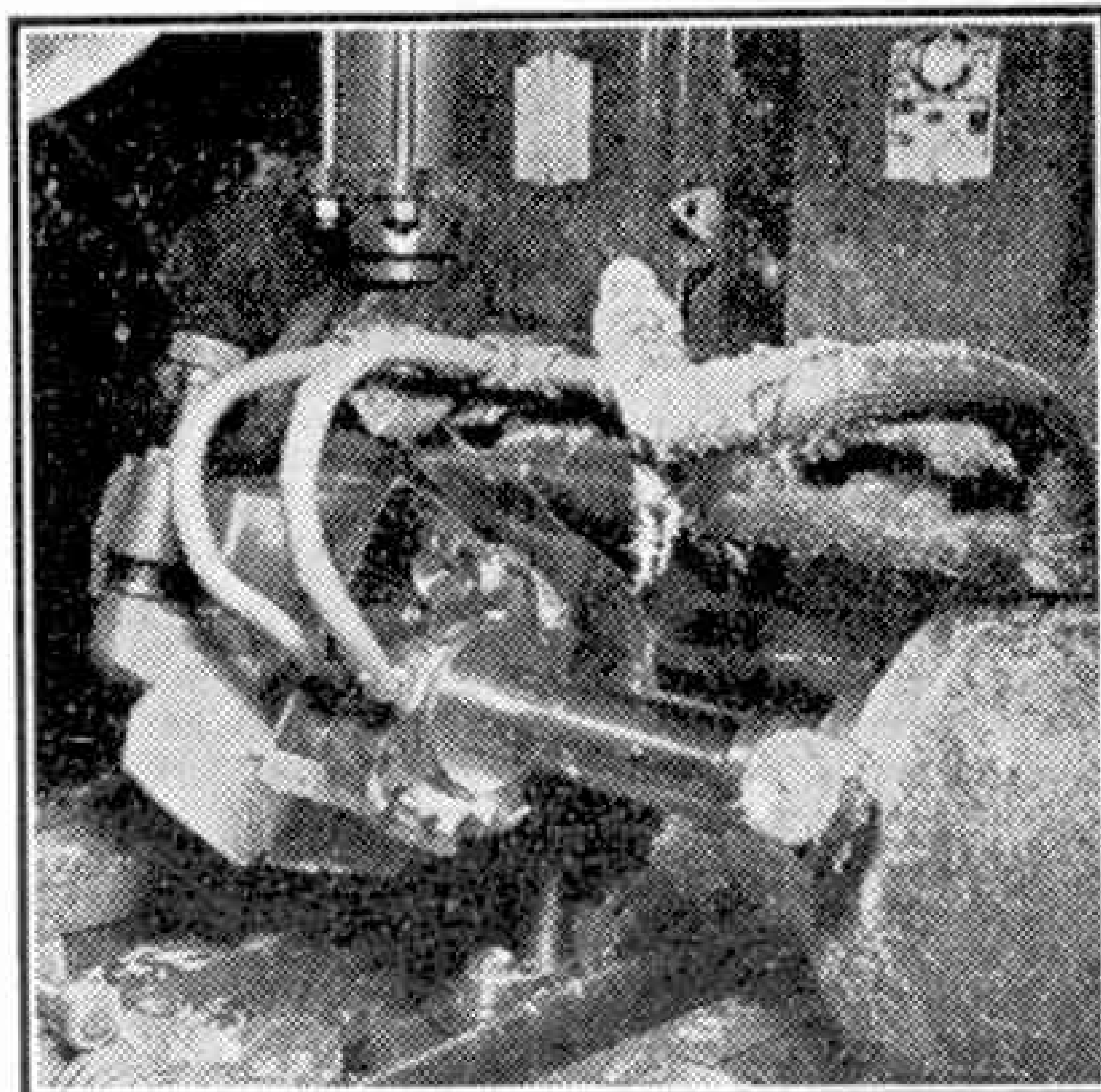
Compressed air clamps are used to fix work in position, but certain parts cannot be dealt with in this way. Then a roller carriage is brought into use. This travels on rails attached to the table tops, and in turn is fastened to the machine carriage. It carries spring-tensioned rollers that hold the parts uniformly and securely.

Carbide tip cutters are used exclusively on the machine. These

have a long life between grinds, and give a high finish, while their use reduces idle time. The parts now being dealt with include one upper and one lower channel for the centre section of the main beam of the Lockheed "Lightning."



A milling machine specially designed to handle large parts for assembly in Lockheed "Lightning" interceptor fighters.



The carbide tip cutters of the Lockheed-Onsrud milling machine at work.

Railway News

New S.R. 0-6-0 Goods Locomotives

On this page we illustrate C1, the first of the new S.R. "Q1" class of 0-6-0 freight engines, designed by Mr. O. V. Bulleid, M.I.Mech.E., Chief Mechanical Engineer of the S.R., to cope with the heavy wartime goods traffic. The weight of the new engines had to be restricted so that they could work over practically the whole system, and by various means has been kept down to 51 tons 5 cwt. That of the tender is 38 tons 1 cwt., giving a total of 89 tons 6 cwt.

One result of the steps taken to keep down the weight has been to give the engine an unusual appearance. Thus the boiler casings project sufficiently over the wheels to make the usual running boards unnecessary, and this led to a saving of 17 cwt. of steel. The casing itself is only a covering, not carrying any load, and therefore was made from very thin plate, and a further saving of 6 cwt. was obtained by making the cab from thinner steel sheet, suitably reinforced. The absence of the usual running boards has made the inside motion, and indeed the whole of the engine, unusually accessible.

The boiler is the largest possible within the weight allowed and the loading gauge, and the fire-box, which is based on that of the "Lord Nelson" class, is the largest in cross-section that can be accommodated while allowing a suitable look-out. The boiler is lagged with Idaglass, a home-produced material which carries no load; and the shape of the casing, which helps to give the locomotive its unusual appearance, was decided by the contours of the cab, fire-box and smoke-box, by the maximum boiler capacity, and by manufacturing conditions. For example, all the ribs of each section are alike, instead of varying with the shape of the boiler over which it is fitted, so that only two patterns have to be manufactured.

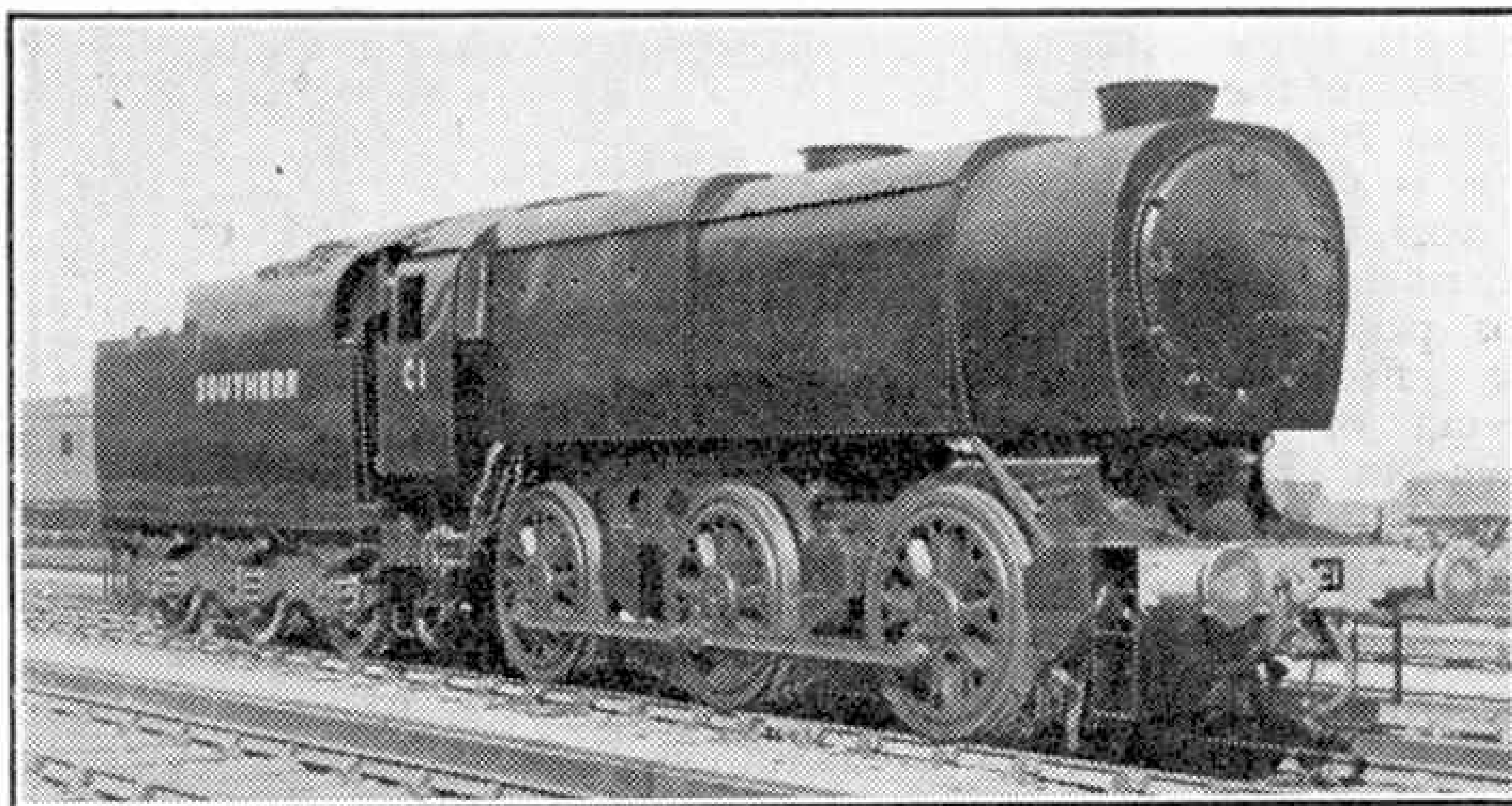
The engine has two inside cylinders of 19 in. diameter and 26 in. stroke, with overhead piston valves, and the drive is taken to the middle pair of wheels. The piston valves are operated through rocking shafts by two sets of Stephenson link gear. The total evaporative heating surface is 1,472 sq. ft., which with a superheating area of 218 sq. ft. gives a total heating surface of 1,690 sq. ft. The fire-box heating surface is 170 sq. ft., and the grate area is 27 sq. ft. The boiler pressure is 230 lb. per sq. in. The 3,700 gal. tender has a tank of welded construction, fitted with a self-trimming bunker with a capacity of 5 tons of coal.

The cast steel driving wheels are similar to those used on the "Merchant Navy" class. The cab is almost completely enclosed, its roof and that of the extension from the top of the front plate of the tender being connected by a flexible strip. The sides of the cab and those of the tender at the forward end have been provided with sliding shutters that can be used effectively during the blackout period, and the gap between them is covered with a loose sheet, so that anti-glare screens are unnecessary.

The blast pipe is fitted with the multiple jet exhaust, five nozzles being used, with the wide chimney that has been found so successful on the S.R.

Popular Railway Catering Services

In one month no fewer than 11,202 meals were recently served in the restaurant cars working between Edinburgh and Aberdeen on the East Coast route. The grand total for the area, including the North British Hotel, station restaurants and the dining cars just mentioned, was 48,618 meals per month, a considerable increase on the previous year's figures. The customers were very largely members of H.M. Forces. Owing to prevailing conditions it has been necessary to restrict catering facilities on certain



C1, the first of the new S.R. "Q1" class of goods locomotives, described on this page. This illustration and the upper one on the opposite page are reproduced by courtesy of the S.R.

trains and stations.

More Loudspeakers for Important Stations

The L.N.E.R. announce that loudspeaker equipment, for the purpose of supplying train information to passengers and staff, is being installed at six more busy stations, namely: King's Cross suburban and Peterborough, Grantham, Doncaster, Sheffield and Nottingham main line stations. New loudspeakers, fewer in number but more efficient as regards radius of audibility, are also to be fitted at York.

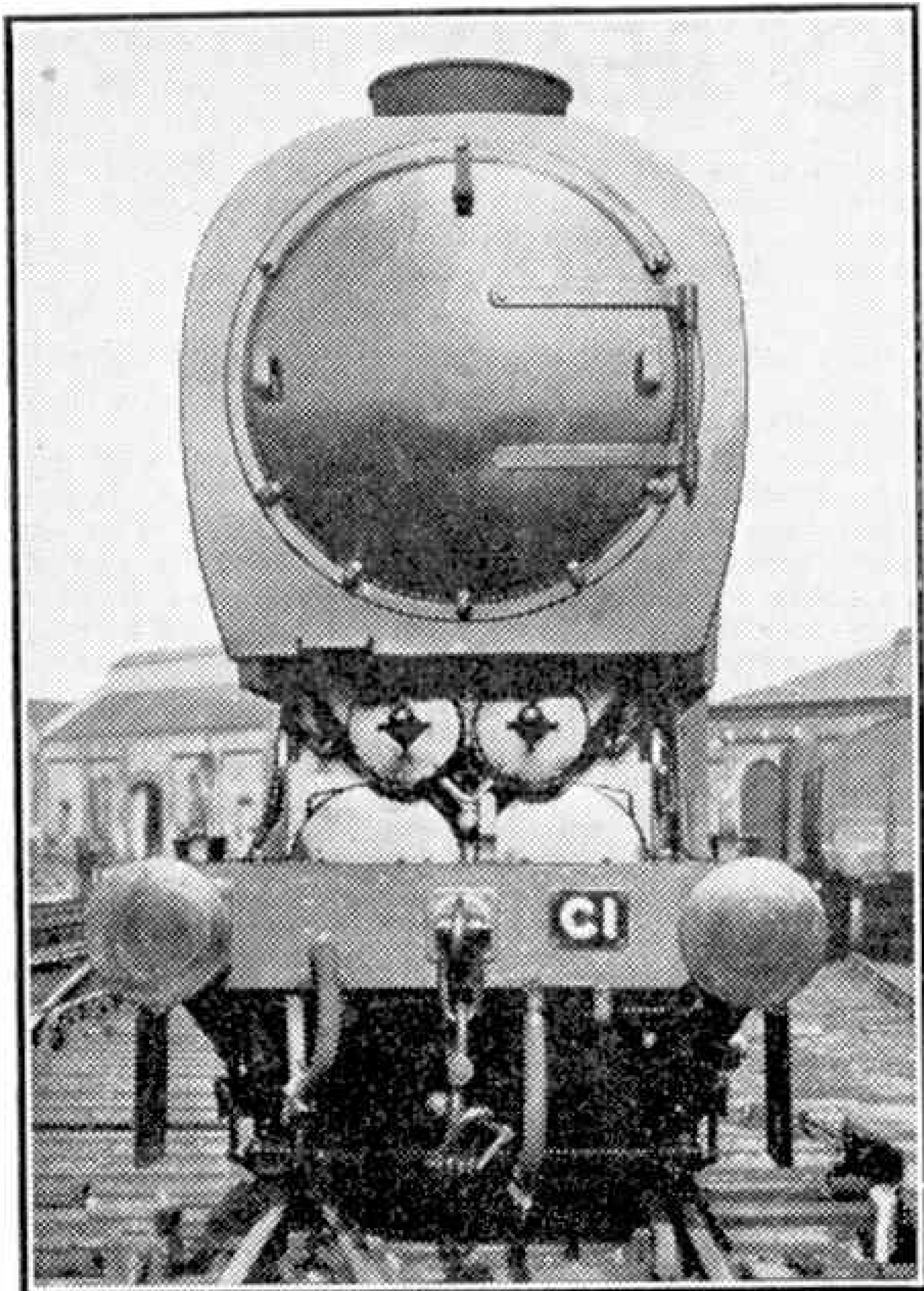
New Egyptian Electric Train

A three-coach set, comprising two motor coaches and an intermediate trailer, has recently been supplied by the Swiss Oerlikon Works to the Ramleh Electric Railway, which actually is more like an urban electric tramway, running partly on its own separate tracks from Alexandria to residential areas along the coast. A heavy traffic is carried.

Water Softening Plants Help Agricultural Effort

Water softening plants are seen at the lineside in various parts of Britain, either adjacent to water troughs or locomotive sheds. These eliminate the lime from hard water by chemical treatment before it is passed to the engine tenders, and thus avoid the formation of scale in boilers. The residue afterwards removed in the form of white sludge has been found of value as an artificial manure.

The average tractive effort of locomotives in the United States has been increased by nearly half during the last 20 years.



Front view of the new S.R. 0-6-0 goods engine.

Stratford Locomotives in the Highlands

One of the most interesting results of the 1923 amalgamation of British railways into four big groups has been the working of locomotives on sections of line far removed from that for which they were originally built. A very good example is shown in the lower illustration on this page, where a former Great Eastern 4-6-0 is shown hard at work on the "farthest North" section of the L.N.E.R., the pre-grouping Great North of Scotland Railway.

The first five of these engines, which were known familiarly as the "1500" class, came from the Stratford works of the old G.E.R. in 1912. They were built primarily for working the exacting Continental Boat trains between Liverpool Street and Harwich. Their instant success led to the multiplication of the class, so that even in pre-1914 days such trains as the "*Norfolk Coast Express*" and other heavy and important East Anglian services were regularly included in their duties. A further series was put into service after the 1914-18 war. After experiments with one of the class another batch with Lentz poppet valves operated from an oscillating camshaft was built in 1928. The original design included piston valves operated by link motion, and this steam distribution gear was resorted to in the massive-looking reboilered design to which some of the engines were rebuilt during the Gresley regime. At the same time opportunity was taken to redesign the valve gear in accordance with modern standards.

The "1500s" or B12/1 class, as they are termed by the L.N.E.R., were ousted from the crack Hook and Antwerp Continentals and from the lengthy and arduous duty involved in running the "*North County Continental*" by the introduction of the "Sandringham" 3-cylinder 4-6-0s. Some of

them went north to the G.N.S. section, and their powerful characteristics and moderate axle loading were well suited to the character of the route, where previously 4-4-0s of small size had been practically the sole motive power. They are well liked by the enginemen, although the distance to be traversed by the fireman in bringing the coal from the tender to the fire-box, due to the lengthy and commodious cab, is said to have earned them the nickname of "The Hikers." It has been suggested, however, that this name is also partly due to the "hiker's pack" in the shape of the A.C.F.I. feed water heating apparatus, clearly shown in the illustration, that some of the engines carry on their boilers.

With the introduction of a "war" livery of black some of the older "1500s" will be carrying their fourth different style of painting. First came the brave blue of the old G.E.R., with many brass trappings; then followed the slatey-grey adopted during the last war and continued until superseded by L.N.E.R. green, now in turn displaced by war black.

A Fine Punctuality Record

At Liverpool Street terminus, London, one of the busiest "all-steam" stations in the world, of the 123 arrivals of trains during the peak period of one morning lately, 110 were punctual and 9 were one min. late. The remaining four were two min. behind time only.

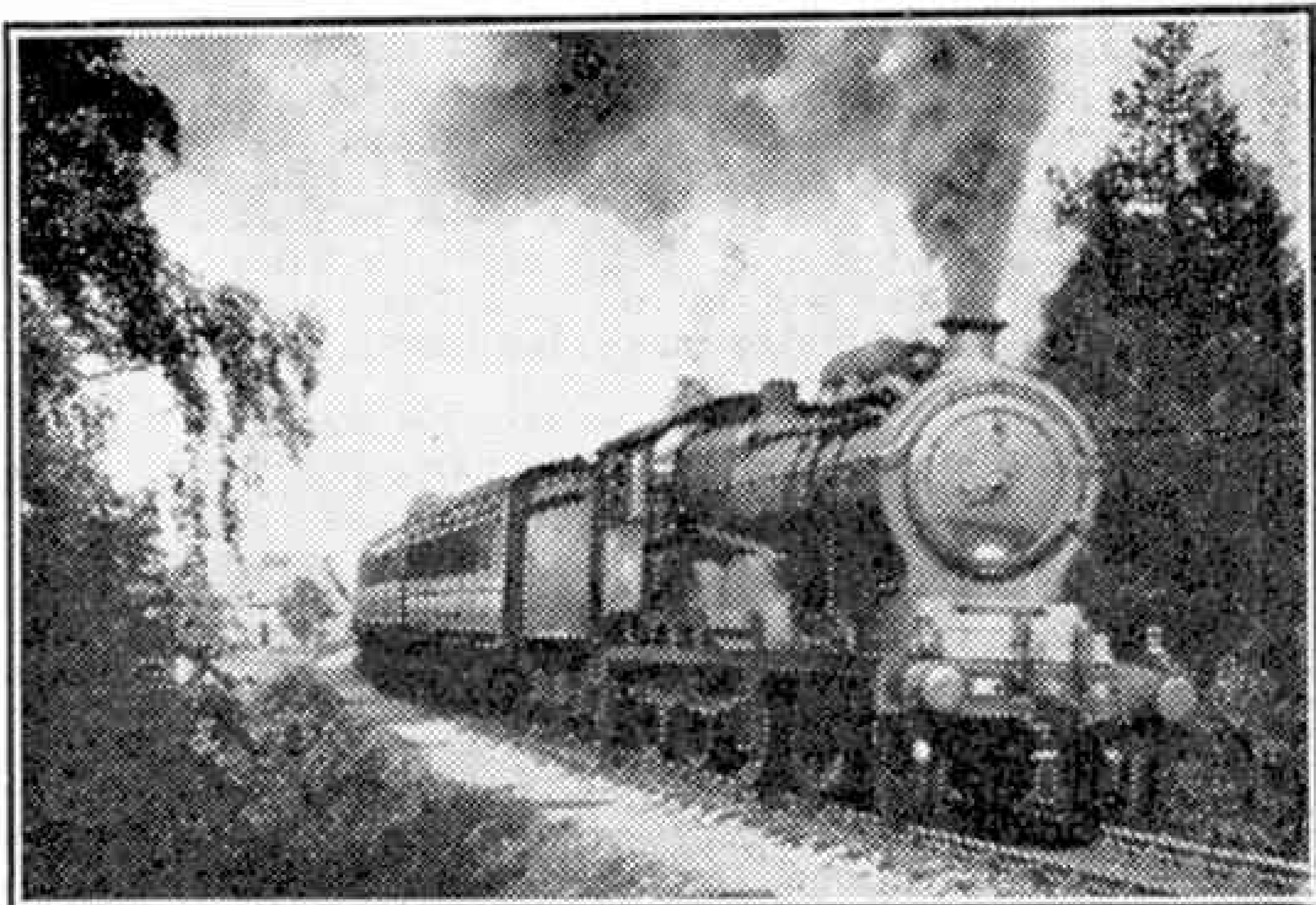
Smaller Rail Tickets

Half-size single journey tickets have made their appearance on the L.M.S., and more of the smaller tickets will come into use in the near future. Two tickets are printed on a piece of card of the same size as a normal single ticket and the card is perforated in the same manner as a return ticket. The two portions are separated by the Booking Clerk as the tickets are issued.

Over 5,000,000 single tickets are issued annually by the L.M.S., and a considerable saving in pasteboard will result from the employment of the new size.

New Locomotives for India

During 1942-3 97 new locomotives have been authorised for Indian railways, all of which are to be built in that country. For the "broad gauge," that is standard 4 ft. 8½ in. or wider, there are to be 57 "XD" 2-8-2 mixed traffic engines, as well as 6 "WV" 4-6-2 express type, intended for service on the East Indian Railway, and the North-Western Railway is to have 4 "XT" 2-4-2T and 10 0-4-2T locomotives. The remainder will be built for the narrow, or metre, gauge lines such as the Bengal and North Western or Rohilkund and Kumaon systems. They are of smaller general service types.



An Inverness-Aberdeen express, on the G.N.S. section of the L.N.E.R., climbing a bank of 1 in 60. The engine is one of the former G.E. "1500" class. Photograph by W. Watt, Lhanbryde, Morayshire.

BOOKS TO READ

Here we review books of interest and of use to readers of the "M.M." With the exception of those issued by the Scientific and Children's Book Clubs, which are available only to members, we can supply copies of these books to readers who cannot obtain them through the usual channels. Order from Book Dept., Meccano Limited, Binns Road, Liverpool 13, adding 6d. for postage.

"EVERYBODY'S WATCHES"

By ARTHUR TREMAYNE (N.A.G. Press. Price 6d.)

This is described as a book for those who own and use watches, and it can be recommended with the greatest confidence. It will give the owners of watches a new respect for their property, and at the same time ensure better treatment for delicate mechanisms that are expected to run 24 hours a day without stop or adjustment. In addition, its readers will gather a wealth of useful and interesting information on time and timekeepers.

Mr. Tremayne tells the story of the watch inside and out, dealing with both the movement and with its case. We see how the former is designed, a task that may last more than a year and involve the preparation of thousands of drawings; and then we follow step by step the building and assembly of its framework, its power unit and gear train, the winding and setting movements, the escapement, which is responsible for the accuracy of the time keeping, and other parts of the mechanism. Special watches of various kinds are described, and finally we learn something of the world-wide nature of watch-making and are told how to set about buying a watch. There are excellent drawings to explain the mechanisms described, and altogether the book is remarkable value for its modest price.

"BLUE BERETS"

By GUNBY HADATH (Lutterworth Press. 7/6 net)

Whether he is writing school stories or adventure yarns, Mr. Hadath is always good, and "Blue Berets" is an excellent example of his skill in turning out a thrilling yarn of an unusual type. It is a record of an English boy's search for the inheritance bequeathed to him by his French ancestors. To this search he is called by an enthusiastic supporter, who wishes to see justice done and to thwart the schemes of an unscrupulous scoundrel who hopes to make use of the boy's rightful estate to enrich himself. The proofs that are required have to be sought in the Alpine region, and the boy is sorely pressed by ruffians hired by the villain, who try all they know to thwart him, and even to kill him. He is aided by French peasants and monks and by the Chasseurs Alpains, and in his quest he makes many fine friends before he achieves his objects.

The tale is told with characteristic humour and romance, and the interest and excitement are admirably sustained until the very end.

"YOUR ALLERGY"

By M. B. COHEN, M.D. and J. B. COHEN
(Scientific Book Club. Members only, 2/6)

Allergy is a word with which we are now becoming familiar, especially those of us who suffer from asthma, hay fever and certain forms of eczema and other skin diseases. We know now that in many cases these are the results of a natural sensitivity that is inherited, and with those who suffer in this manner discomfort of various kinds follows on the most simple actions that have no effect whatever on others. For instance, most of us enjoy the scent of new-mown

hay, but to some it brings sneezing and pains in the head; while with others even eating an apple may lead to wheezing and coughing!

It is with diseases of this kind, summed up under the name of allergies, that this book deals. It is not one that will appeal to all readers, but older ones, and especially those who are troubled by recurring attacks of the kind indicated, will find it of the greatest interest. It is well written, and is full of illuminating facts about allergies and their treatment. This of course is a matter for professional guidance, but sufferers will be greatly helped by the authors' advice, and by their careful discussion of hay fever, asthma and other common allergic conditions.

"THE SECRET OF ROSMERSTRAND"

By ERROLL COLLINS (Lutterworth Press. 6/-)

A gigantic fleet of underwater tanks gathered together for the invasion of Britain is discovered by Flying Officer Jerry Carslake when he stumbles on the ancient castle of Rosmerstrand, on the Danish Coast. The tanks are fearsome indeed—monsters fitted with creeper tracks, searchlights, flame throwers and a new and deadly type of gun. Just as he learns of this, and discovers the date on

which the invasion is to begin, an unlucky incident throws him into German hands, and from then onward he is struggling desperately to find means of getting away to carry a warning of what is coming. He bluffs German soldiers, fights duels with airmen and has a tremendous struggle on board a Nazi troop carrier. After all his efforts he is forced to return to the grim cavern where he had first seen the secret weapon, but he succeeds in making a thrilling escape. Thanks to the warning he conveys, the shallow water through which the underwater armoured division is advancing to the conquest of Britain is filled for hours with exploding depth charges and whistling torpedoes, and a vast sea of oil rising to the surface announces the destruction of Hitler's invaders.

The story is full of movement and excitement, and the picture it gives of the underwater tank may well prove prophetic. The yarn will give a real thrill to any boy.

"THE ART OF STORY-WRITING"

By LES PRESTON
(Stone Publishing Agency. 5/- net)

Mr. Preston says that anyone who can write an interesting letter can write a story, for the whole art is that of holding the reader's interest; and in this little book he gives beginners the benefit of his own trials, and of the experience that he gained in establishing himself. Those who set out to master the art of story writing will find the book very helpful indeed. The routine of production is divided into easy stages, through which the would-be author warms up and gains practice until his story is finished and revised; and the method is illustrated by the analysis of three of Mr. Preston's own stories, which emphasise particularly the need for action and good natural dialogue, and show how best to achieve these. Then follows practical advice on getting stories placed, and the book ends with a guide to periodicals and publishers.

Owing to wartime difficulties, it is impossible to guarantee prompt delivery of books ordered as described at the head of this page, but every effort will be made to ensure speedy despatch.

Fast Running in New Zealand

By T. A. McGavin

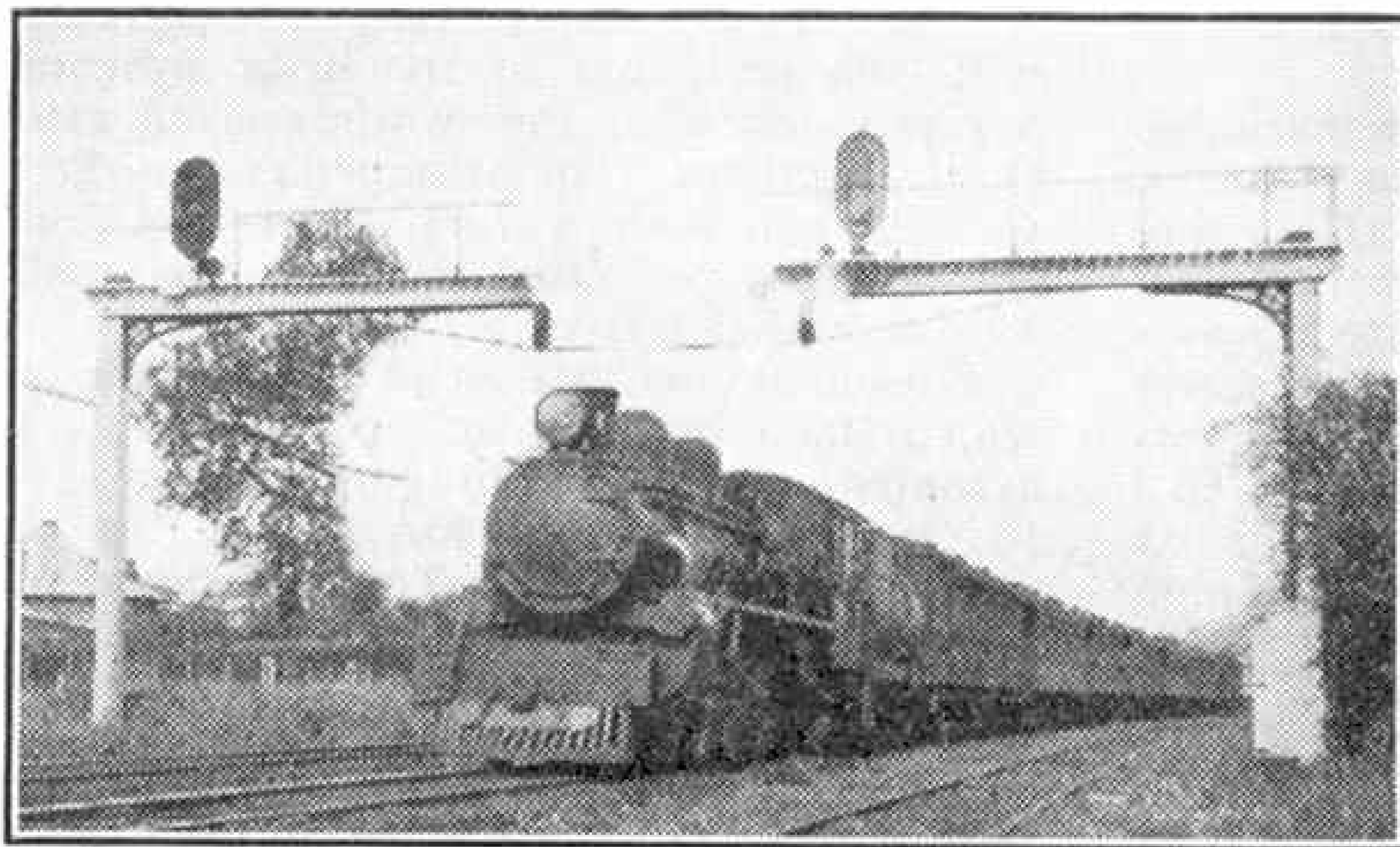
THE overall average speed of 30 m.p.h. for the crack expresses of New Zealand, quoted by "A Railway Engineer" in his article in the October 1941 issue of the "M.M." does not suggest that any very high speeds are attained. Indeed, on the main lines of New Zealand speed is limited to a nominal maximum

good performance.

The second run was made in the South Island, on the Invercargill-Lyttleton express, with one of the Class "Ab" 2-cylinder simple "Pacific" engines. These are rather more powerful than the compounds, but even so have only 32½ tons adhesion weight, compared with the 60-66 tons of British "Pacifics." The load was quite a heavy one of 370 tons, and the high-speed running this time was made over only moderate falling gradients, in the 17.8 mile run from Burnham to Christchurch. The steepness of descent varies, averaging about 1 in 400 for much of the way, though including odd half miles as steep as 1 in 220; even this latter however is less than the famous Stoke bank, in England, where so many great L.N.E.R. speed records have been made.

Before Burnham some very good running had been accomplished, with a time of only 22½ minutes, start to stop, for the 17.7 miles from Rakaia; this section included a top speed of 60 m.p.h. The finest work came, however, after the restart from Burnham. Speed was up to 50 m.p.h. in just over 4 miles from the start, and then an average of 57½ m.p.h. was kept up for 11 miles. This included a

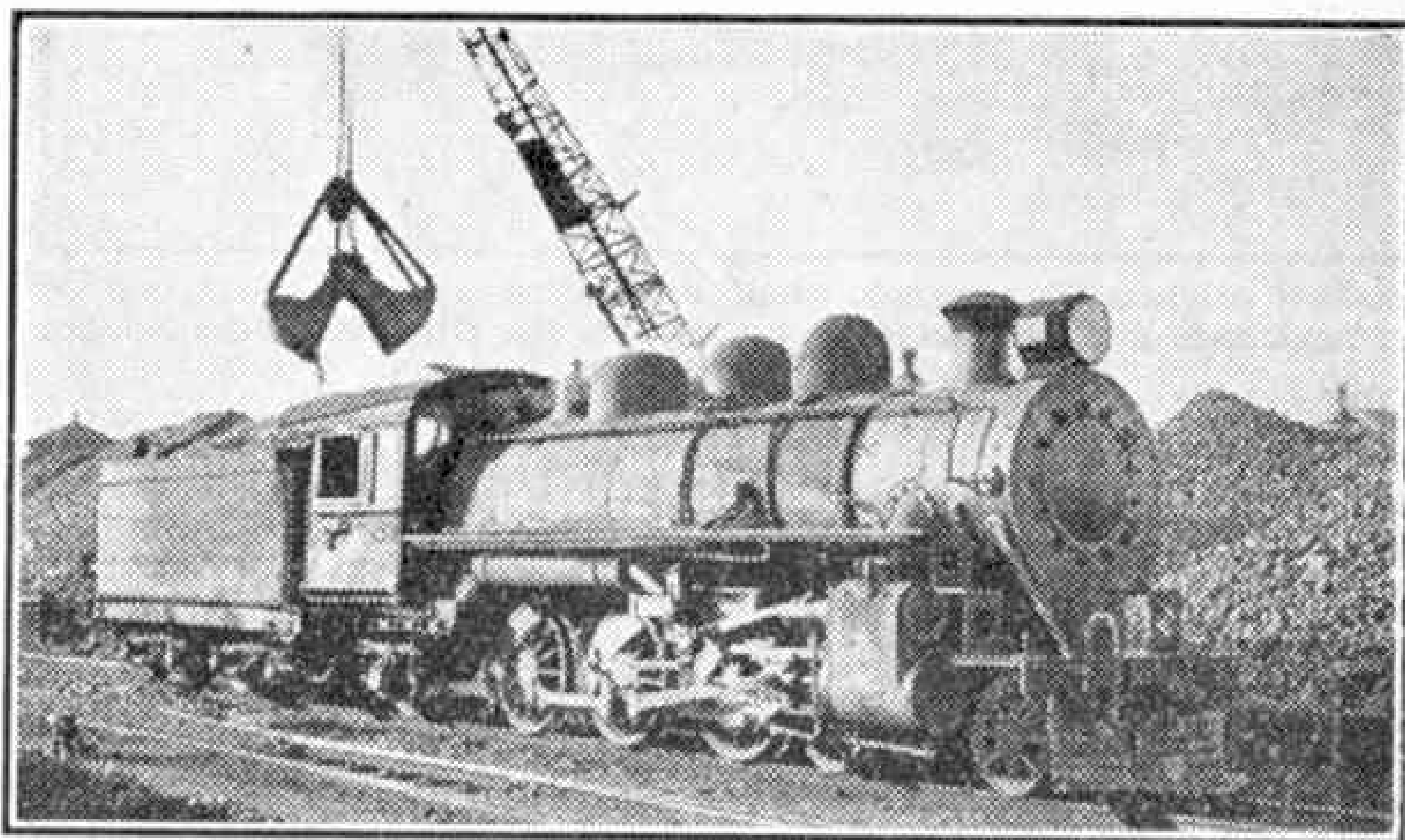
maximum speed of no less than 64 m.p.h., reached within one mile of a station called Hornby. The result of this fine running was that Addington station, 16½ miles from the stop at Burnham, was passed in 20½ minutes, though a cautious approach to Christchurch made the last 1.3 miles take 3 minutes to the



A typical New Zealand express, hauled by a Class "Ab" Pacific engine. Note the colour-light signals. Photograph by W. W. Stewart.

of 50 m.p.h.; but although the coupled wheels of the express passenger "Pacific" engines are only 4 ft. 6 in. in diameter, some considerably faster running is made at times, and on two recent journeys of mine speeds of well over 60 m.p.h. were attained. The first of these was on the Woodville-Wellington mail by one of the "A" class 4-cylinder compound "Pacifics," first introduced in 1906-7, hauling a load of 215 tons. It was in the 28.3 miles between Masterton to Cross Creek that the most notable work was performed; here a start-to-stop run of 8.9 miles in 11½ minutes included a top speed of 63 m.p.h. down a moderate gradient, and another short run of 4.9 miles was done, start to stop, in 7½ minutes with a maximum speed of 59 m.p.h.

The most extraordinary work was however reserved for the last stage, which includes a very steep climb at 1 in 40. The train was banked on this ascent, but the assistant engine came on, not at the foot of the incline, but at Featherston, and prior to the heavy collar work there was a fast stretch to be covered. The bank engine was a 2-6-4 tank, of Class "Wf," with 3 ft. 9 in. coupled wheels, but in spite of this the train went spinning down to Pigeon Bush, on steeply falling gradients, at 60 m.p.h. This short initial run of 4.1 miles took only 5½ minutes, start to stop. A speed of 60 m.p.h. is of course extraordinary with 3 ft. 9 in. wheels; this is equivalent, in revolutions per minute, to 104 m.p.h. on a typical British express locomotive having 6 ft. 6 in. coupled wheels. On the 1 in 40 gradient up to Cross Creek the two engines sustained 20 m.p.h.—another very



A New Zealand "Pacific" of Class "Aa," built by Baldwin Locomotive Co., U.S.A., in 1914. Photograph by Hugh Bennett.

stop. This was an excellent piece of work, though certainly not an everyday performance.

Another fast spell I noted was on the Wellington-New Plymouth express, when one of the big Class "Ka" 4-8-4s, with a load of 405 tons, averaged 51½ m.p.h. for 13 miles, including a maximum of 60 m.p.h.; also another in the South Island, with a pair of Class "Ab" Pacifics on a 470-ton train, which ran at 50-55 m.p.h. for 25 miles on end.

Famous Inventors

Thomas Alva Edison

II.—The Telephone and the Phonograph

EDISON soon found that manufacturing and inventing could not be combined satisfactorily, and so in 1876 he left Newark for Menlo Park, 24 miles from New York City, and there devoted himself entirely to research.

In 1876 there occurred the remarkable coincidence of two applications for a patent for an invention for "transmitting vocal sounds telegraphically" being filed on the same day with the United States Patent Office. The first was by Alexander Graham Bell; and the second, filed two hours later, by Elisha Gray. Bell's telephone was exhibited to the public at the Centennial Exhibition at Philadelphia

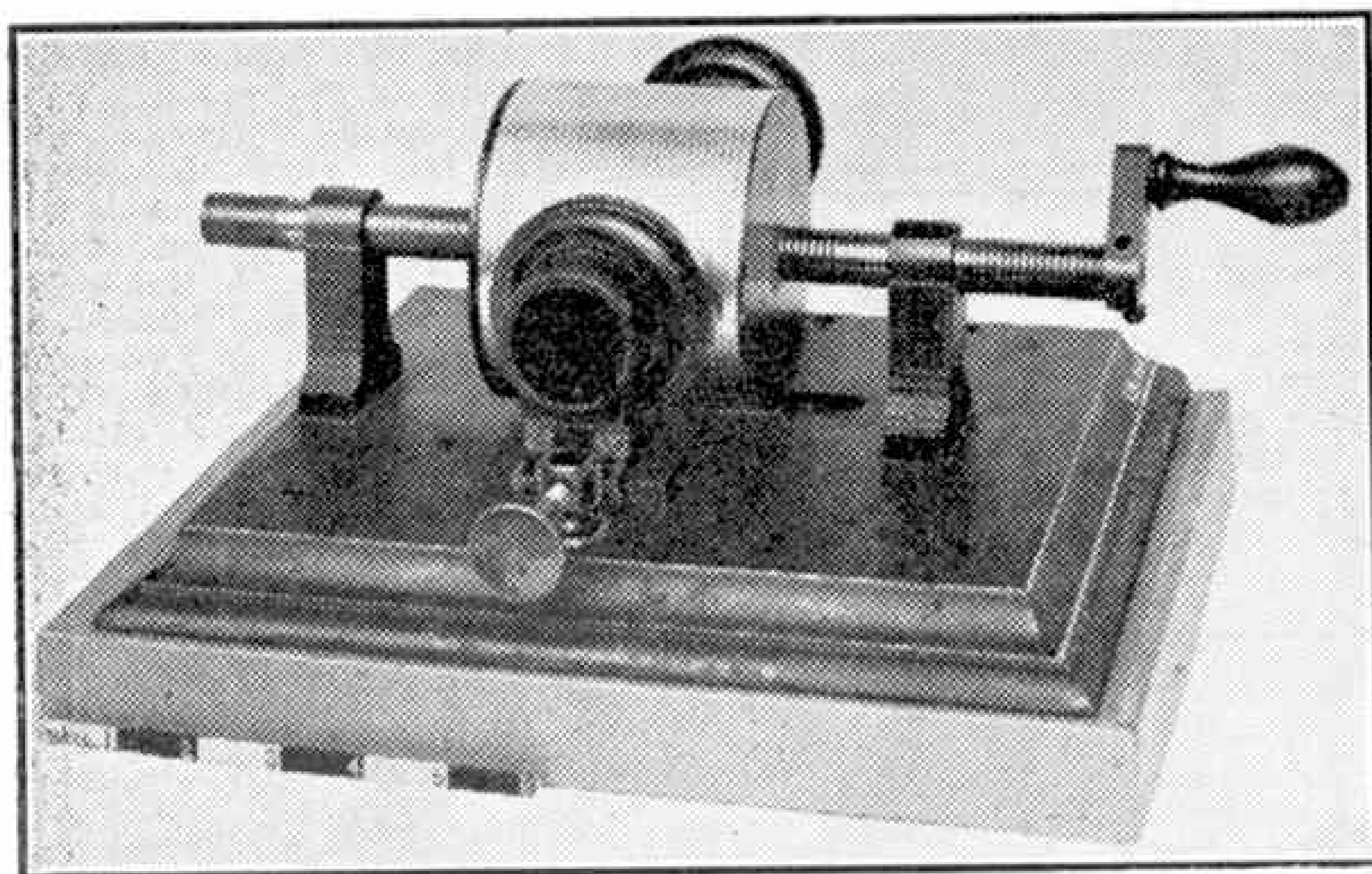
the magnet coil and produced rapid variations in the strength of the magnet, which exerted a rapidly varying pull on the iron diaphragm. This second diaphragm was thus set vibrating exactly in accordance with the first, and so the listener heard a reproduction of the words spoken into the transmitter. The arrangement worked well enough over a very short line, but the currents generated were far too small for transmission over long distances.

Edison devised a special transmitter in which the vibrations set up by the voice actuated a mica diaphragm, causing this to press with varying force on a disc of carbon in the circuit. The resistance of the carbon varied in accordance with the pressure, and the varying current that resulted set up corresponding vibrations in the diaphragm of a Bell receiver. This Edison transmitter was an enormous improvement, and it made possible the development of the telephone as a commercial instrument.

It is interesting to note that during his experiments Edison used the word "Hello!" in calling up. This custom spread from Menlo Park and became adopted by telephonists all over the world.

On 24th December 1877

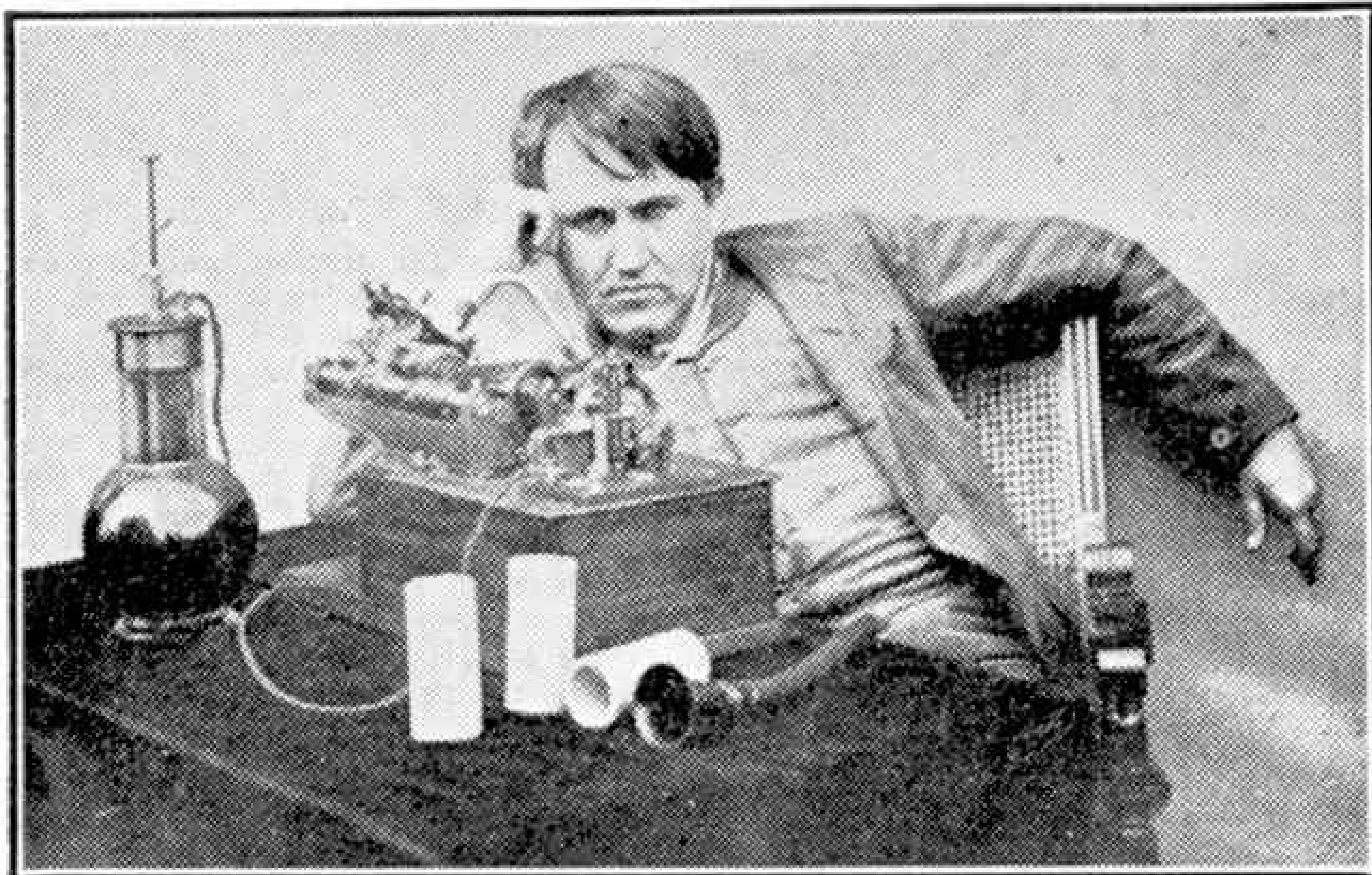
Edison filed at the United States Patent Office his first patent for the phonograph and the patent was granted on 19th February in the following year. The origin of this invention may best be described in Edison's own words. In an article written by him ten years later for the "*North American Review*" he said: "We have all been struck by the precision with which even the faintest sea-waves impress upon the surface of a beach the fine, sinuous line which is formed by the rippling edge of their advance. Almost as familiar is the fact that grains of sand sprinkled on a smooth surface of glass or wood on or near a piano sift themselves into various lines and curves according to the vibrations of the melody played on the piano keys.



Edison's original Phonograph. This illustration and the lower one on the next page are reproduced by courtesy of the Director of the Science Museum, South Kensington, London.

in the same year. It had many serious defects, however, and the Western Union Telegraph Company asked Edison to take it in hand and make it a really practical system.

Bell's telephone made use of the same instrument for both transmitting and receiving. This consisted of a diaphragm of thin sheet-iron placed close to the pole of a bar electro-magnet. The air vibrations set up by the voice caused the diaphragm also to vibrate, that is to make extremely small movements backward and forward. These tiny movements were sufficient to set up in the magnet coil rapidly alternating currents of varying strength, which were transmitted along the line wire to the receiver. There they passed through



Edison listening to his Phonograph.

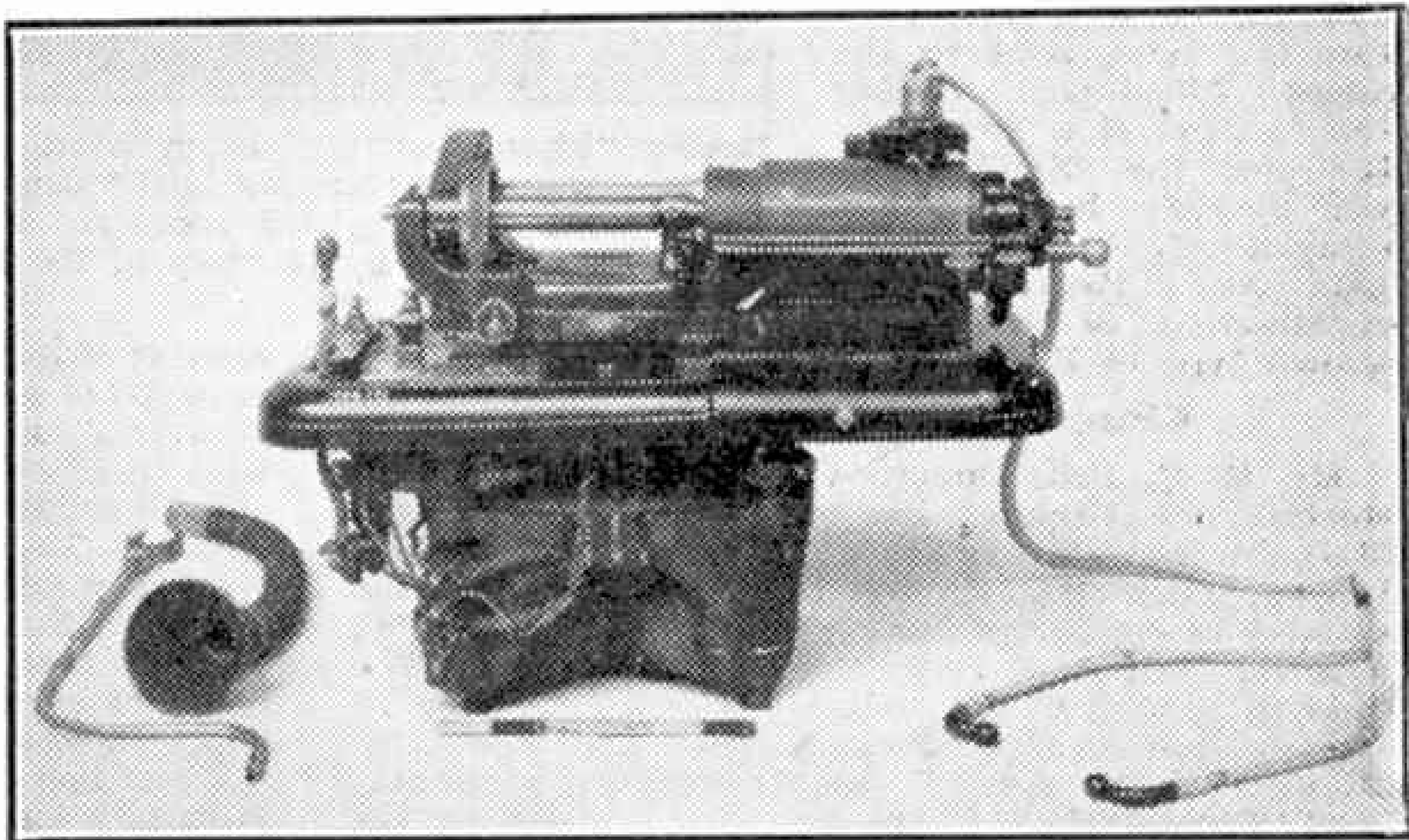
These things indicate how easily the particles of solid matter may receive an imparted motion, or take an impression, from delicate liquid waves, air-waves, or waves of sound. Yet, well known though these phenomena were, they apparently never suggested until within a few years that the sound-waves set going by a human voice might be so directed as to trace an impression upon some solid substance with a nicety equal to that of the tide recording its flow upon a sand beach.

"My own discovery that this could be done came to me almost accidentally while I was busy with experiments having a different object in view. I was engaged upon a machine intended to repeat Morse characters which were recorded on paper by indentations that transferred their message to another circuit automatically when passed under a tracing-point connected with a circuit-closing apparatus. In manipulating this machine I found that when the cylinder carrying the indented paper was turned with great swiftness, it gave off a humming noise from the indentations—a musical rhythmic sound resembling that of human talk heard indistinctly. This led me to try fitting a diaphragm to the machine, which would receive the vibrations or sound-waves made by my voice when I talked to it, and register these

vibrations upon an incompressible material placed on the cylinder. The material selected for immediate use was paraffined paper, and the results obtained were excellent. The indentations on the cylinder, when rapidly revolved, caused a repetition of the original vibrations to reach the ear through a recorder, just as if the machine itself were speaking. I saw at once that the problem of registering human speech so that it could be repeated by mechanical means as often as

might be desired was solved."

When Edison had got the idea of the phonograph clearly in his mind he made a rough sketch and instructed John Krusei, whom he often described as the best mechanic he ever had, to make a model. Krusei, working for 30 hours without a break in the manner typical of Edison's assistants when there was a big job on hand, completed the model and took it to the inventor. Slowly Edison turned the cylinder and spoke into the receiver the first words of "*Mary had a little Lamb.*"



Edison-Bell Phonograph of 1886.

The cylinder was moved back to the starting point, and then very faintly, but quite distinctly, the instrument reproduced his words.

The first phonograph made its recordings on tinfoil wrapped round a cylinder, but this material retained its impressions clearly for only a very short (Continued on page 230)

Air News

Handley Page "Halifax" Bomber

More details of the Handley Page "Halifax" 4-engined bomber are now available. When work on the design was begun late in 1937 it was intended that the machine should be a twin-engined bomber, but in 1938 the design was revised to a 4-engined arrangement. The first "Halifax" made its initial flight in the late summer of 1939, and production models began to go into service with the R.A.F. in the autumn of 1940.

This fine heavy bomber is a middle wing monoplane with a wing span of 99 ft. It is armed with eight .303 Browning machine guns installed in three Boulton Paul gun turrets, one turret in the fuselage nose, another in the stern, and one amidships on the top of the fuselage. Normally the crew total seven, and consist of two pilots, a navigator who also acts as bomb-aimer, a wireless operator, and three gunners—one for each of the turrets.

A photograph of a "Halifax" was reproduced on page 367 of the December 1941 "M.M."

Corvette Tows Disabled "Sunderland" for 5½ Days

"*Auricula*," an American corvette, went to the aid of a R.A.F. "Sunderland" flying boat which became disabled during Atlantic patrol, and had to descend on the water while still far out over the ocean. The weather was bad, with heavy seas running, but a tow rope was fixed up, and the corvette began to tow the flying boat to the nearest Allied port. During the 5½ days' slow voyage to the port the "Sunderland" was severely buffeted, but remained afloat. The incident gave proof of the very robust construction of this well-known type of British flying boat.

Canada Producing More Aircraft

Mr. R. P. Bell, Director-General of Aircraft Production, in Canada, has given some interesting statistics showing how the Canadian aircraft industry has expanded since the war began. In that time the number of employees has risen from 1,000 to 40,000, and the output of completed machines from 40 a year to 10 a day! The industry is now producing 16 twin-engined Bristol "Bolingbroke" and 100 twin-engined Avro "Anson" trainer-bombers a month. The "Bolingbroke" is the Canadian version of the Bristol "Blenheim" bomber.

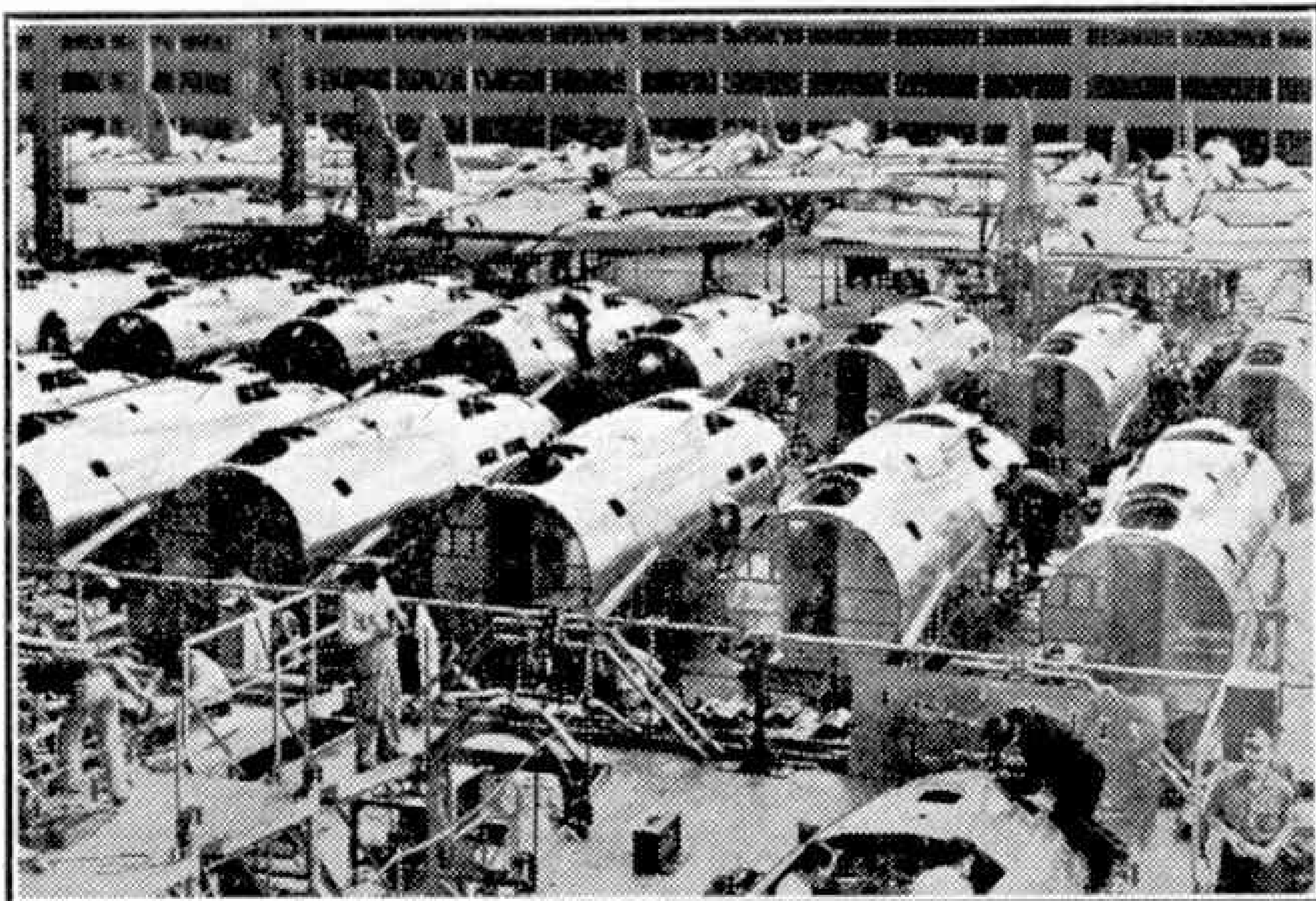
American Civil Air Patrol

Mr. F. H. La Guardia, the well-known Mayor of New York, and director of the "Office of Civil Defence," has created an American Civil Air Patrol for the duration of the war. It is planned to enlist about 280,000 persons, 90,000 of whom will be licensed air pilots, a similar number student pilots, and the remainder ground staffs. The equipment of the Patrol is expected to total about 23,000 civil aircraft and about 2,000 aerodromes in the United States not being used for military or scheduled purposes will be brought into the scheme.

New R.A.F. Film

The great debt owed to our airmen who day and night carry on the increasing offensive against the enemy is vividly brought home in a new short film "*Knights of the Air*," released in London in April last, and which in the following 15 weeks will be shown throughout the country.

The film has been made by Fred Watts, of Pathe, whose own two sons are in the R.A.F.—the youngest is now training in Canada for his wings. In 10 min. of breathless action it runs the whole gamut of the R.A.F.'s many-sided operations. Back in the momentous days of 1940 one sees the young fighter pilots—the immortal "few"—taking off for the grim air



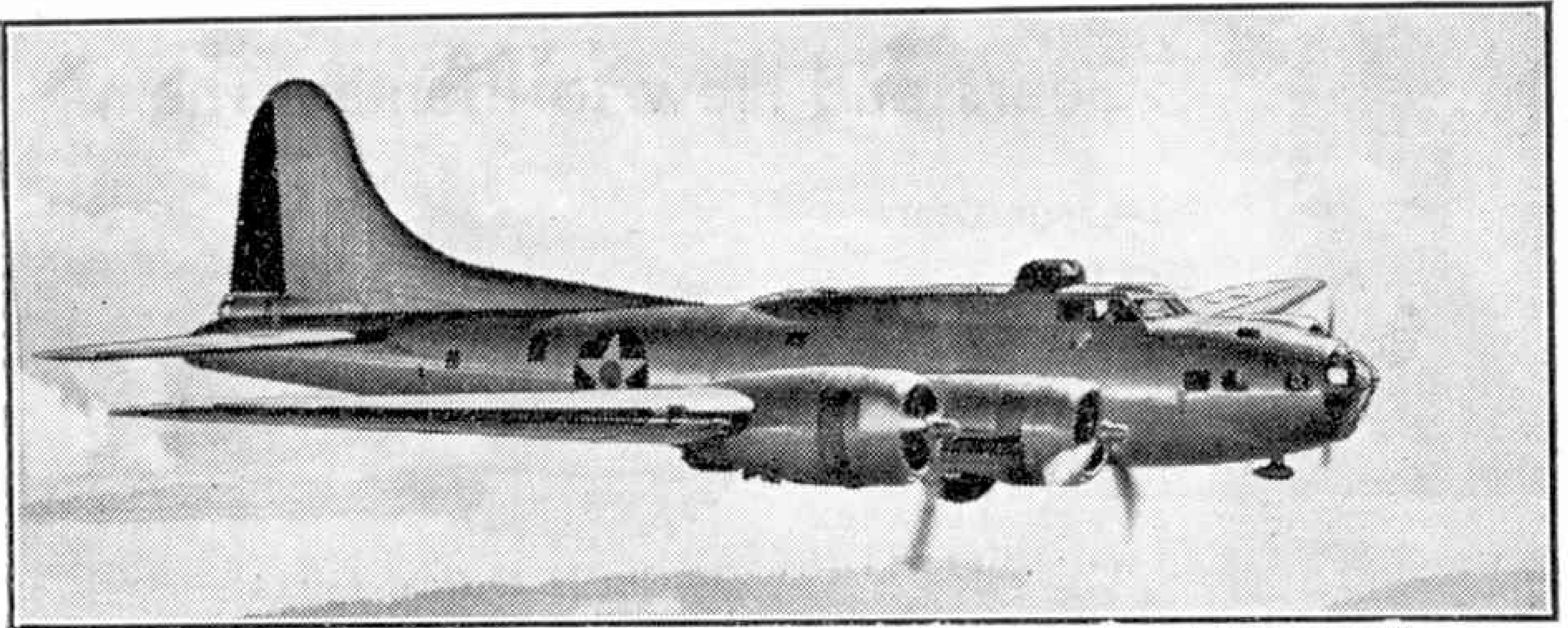
Boeing "Flying Fortress" heavy bombers in mass production. The fuselages in the foreground are receiving final touches before the wings are added, and in the background are completed bombers. This photograph and the upper one on the next page are by courtesy of the Boeing Aircraft Company, Inc., U.S.A.

fighting of the Battle of Britain, and authentic "shots" show Nazi bombers crumpling up under the fire of "Spitfires" and "Hurricanes." Bombers fill the skies with speeding wings and pulsing engines, and coastal aircraft are shown at their unsleeping task of guarding Britain's lifelines.

Close-ups of several R.A.F. heroes, notably Squadron Leader "Paddy" Finucane, D.S.O., D.F.C., and Sergeant Hannah, V.C., recall some of the outstanding deeds of heroism of the air fighting. There are also shots of some of the Air chiefs, including a rather unusual one of the Prime Minister in his uniform as Honorary Air Commodore of No. 615 Fighter Squadron.

The film is introduced by Air Vice-Marshal H.R.H. the Duke of Kent, and the whole cost of making it and copies from it has been borne by the Cinema trade. It is hoped to raise at least £100,000 by collections at cinemas where the film is being shown.

TWA-New England, Inc., a company in which both Transcontinental and Western Air, Inc. and the New Haven and Hartford Railroad, U.S.A., have interests, applied recently to the U.S. Civil Aeronautics Board for authority to operate regular air services which would link up 19 cities between New York and Boston, and provide combined rail and air travel facilities to the southern part of New England.



A fine flight photograph of one of the latest Boeing "Flying Fortress" bombers, type B17E.

Wright "Whirlwind" Aero Engines to be Made in Brazil

Under an agreement signed between the Wright Aeronautical Corporation, U.S.A., and the Brazilian government, "Whirlwind" aero engines are to be manufactured in Brazil by a company just formed there named "Fabrica Nacional de Motores." This company will make the "Whirlwind" 7-cylinder and 9-cylinder types, ranging from 235 h.p. to 450 h.p. The lower illustration on this page shows Col. A. G. Muniz, aeronautical engineer and official representative of the Brazilian government, with officials of the Wright company, inspecting a 9-cyl. "Whirlwind" engine similar to those which will be made in Brazil.

An R.A.F. Record Flight Recalled

Among recent awards of the Distinguished Flying Cross was one to Wing Commander B. K. Burnett, R.A.F., for fine work as Officer Commanding No. 51 Squadron, in which capacity he has played an important part in operations against the enemy.

Wing Commander Burnett joined the R.A.F. in 1934, and four years later as a member of the Long

Range Development Unit he took part in the famous world record long-distance flight from Ismailia to Port Darwin, Australia, in November 1938. This 7,162 miles non-stop flight was accomplished by two Vickers "Wellesley" machines of the R.A.F. The awards made to the crews of the aircraft included the Air Force Cross to Burnett.

The D.H. "Gipsy Major" Engine

The Air Ministry have paid a striking tribute to the reliability and long life of the D.H. "Gipsy Major" aero engine, many thousands of which are in service. They announced recently that after consultation between the Directorate of Repair and Maintenance and the R.A.F. Training Command, it has been agreed that the period between overhauls of this engine shall be increased to 1,260 hrs., without even top overhauls during that time. This is a record for a British aero engine, and may even be a world record.

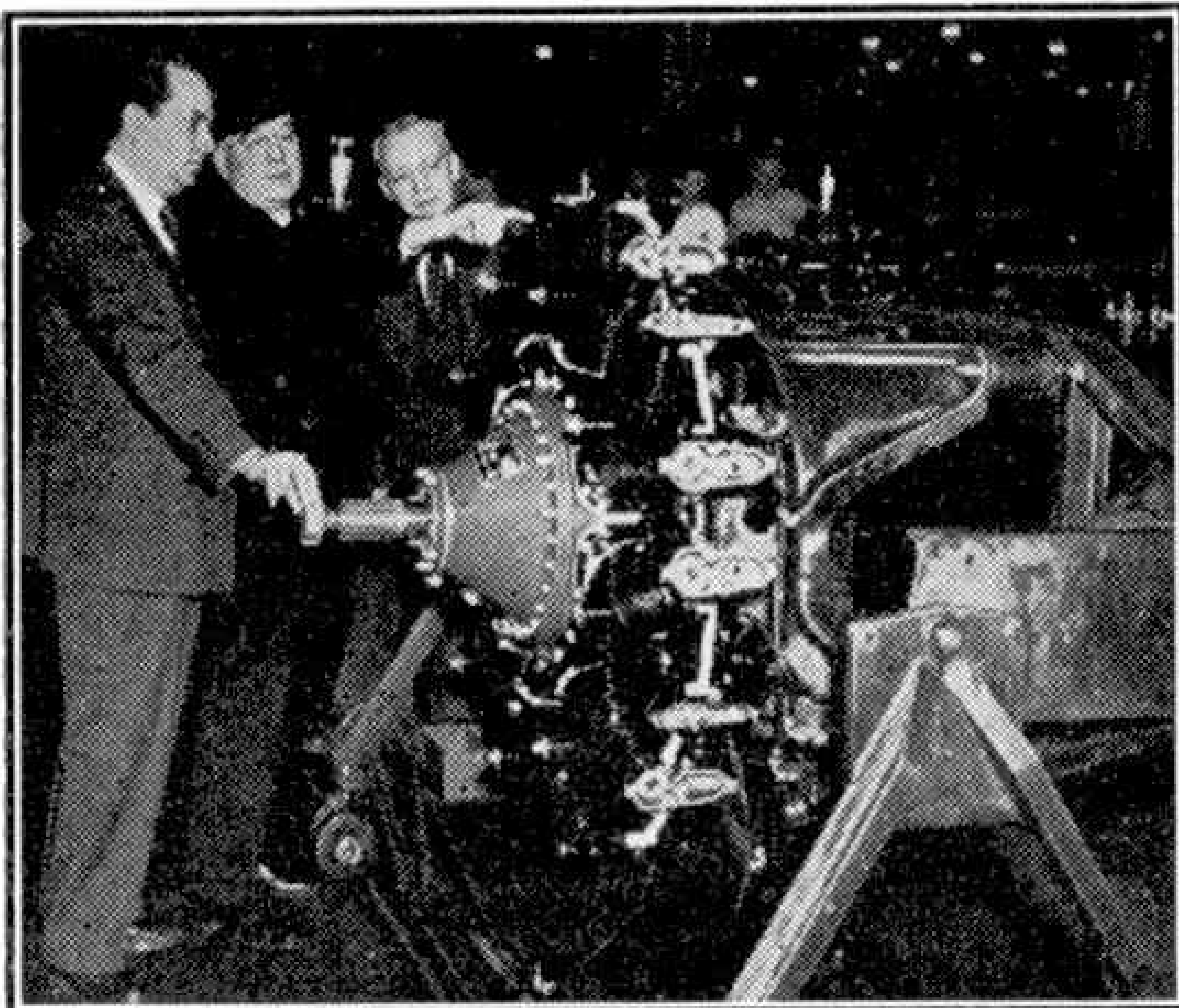
When the "Gipsy Major" 4-cylinder air cooled engine was introduced in 1932 the overhaul period was 450 hrs., and in July 1933 it was increased to 750 hrs. A further extension to 1,000 hrs. was made in August 1937, and the R.A.F. have been working within this figure, at 900 hrs. The latest extension has almost trebled the original overhaul period.

Success of British Airways' Service to Lisbon

Between June 1940 and the end of March this year 8,391 passengers and 722 tons of mail and freight were flown on British Airways' regular air service between this country and Lisbon without mishap. At Lisbon some of the traffic was transferred to and from the big "Clipper" flying boats of Pan American Airways, which until recently made Lisbon the European terminus of their transatlantic service. Now that the service has been extended to Eire, connection is made there with a shuttle service to and from Britain, operated by British Airways.

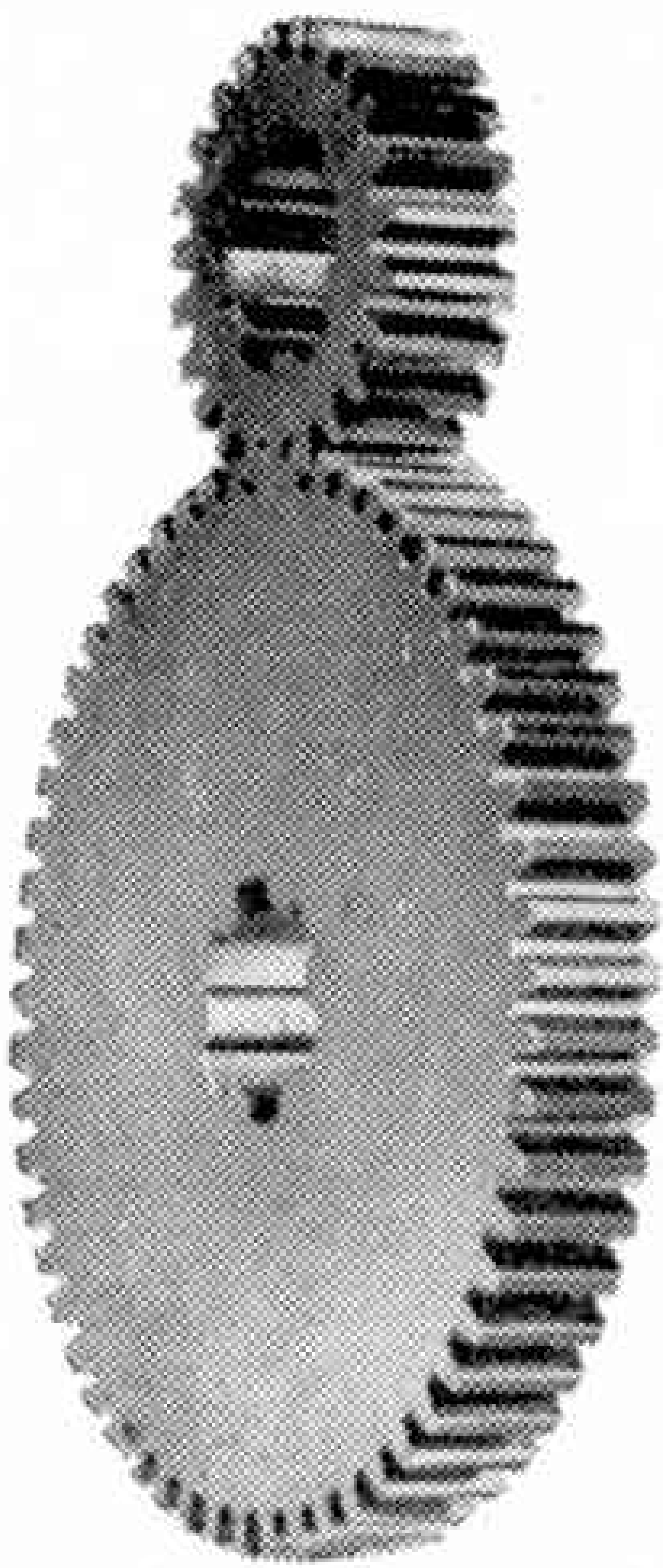
A Job for American Model Aircraft Builders

The Secretary of the U.S. Navy has asked the thousands of high school boys in that country to help the Navy's war training programme by making 10,000 models of each of 50 different types of fighter aircraft, a total of half a million models! Plans and specifications for the model machines are being prepared by the U.S. Navy Bureau. The models will be used for training in range estimation in gunnery practice, and for training both naval personnel and civilians in aircraft recognition. This interesting scheme seems likely to prove very popular.



Wright "Whirlwind" aero engines are to be produced in Brazil. Col. A. G. Muniz, official representative of the Brazilian government, is here seen (on the left) inspecting a 9-cyl. engine similar to the types to be made in that country. Photograph by courtesy of the Wright Aeronautical Corporation, U.S.A.

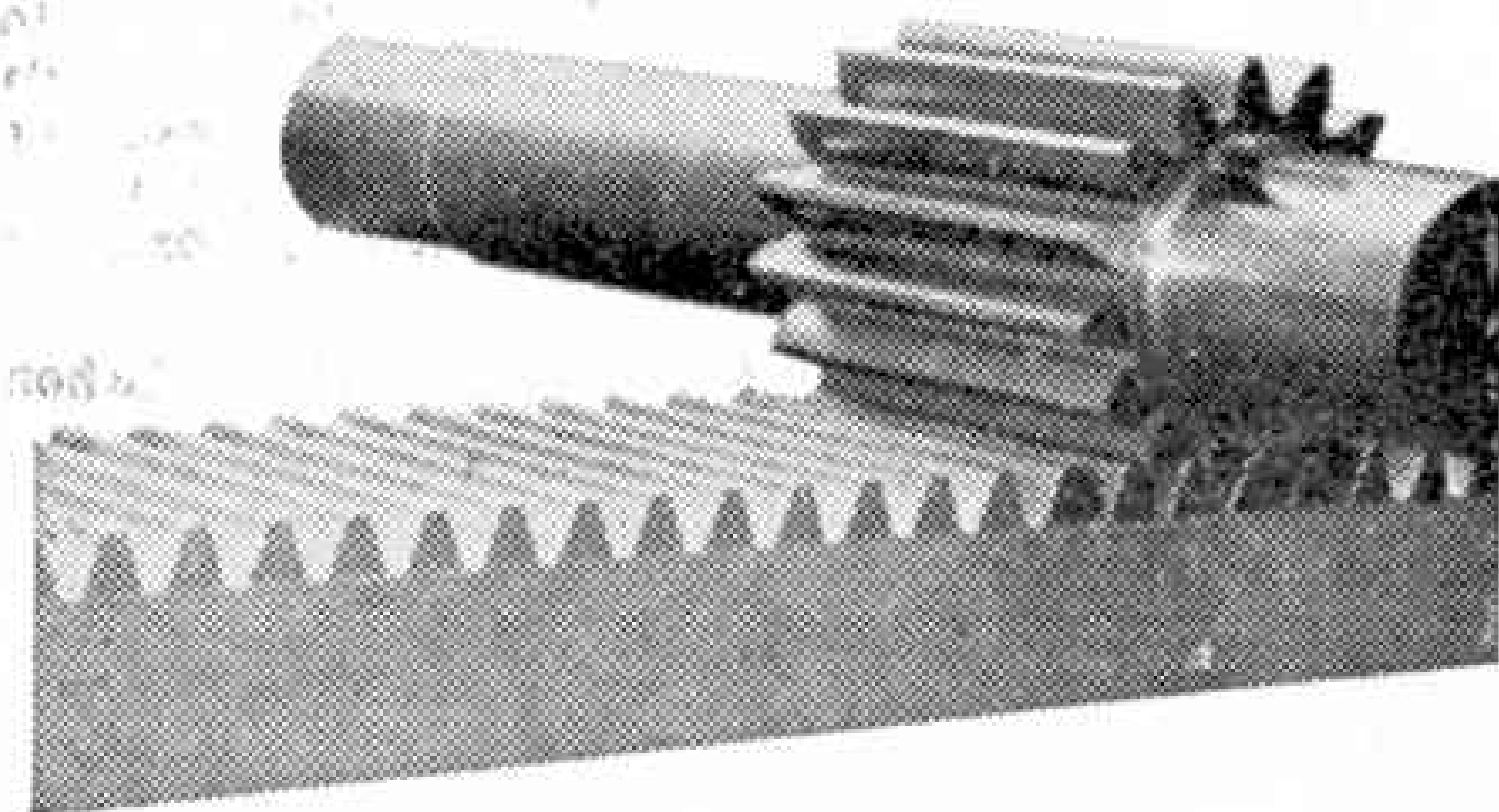
Gears and How to Identify Them*



1—Spur Gears

SPUR gears are the most simple form of gears and are used to transmit motion and power between two parallel shafts. They are easily identified by the teeth being straight and parallel to their axes. The speeds

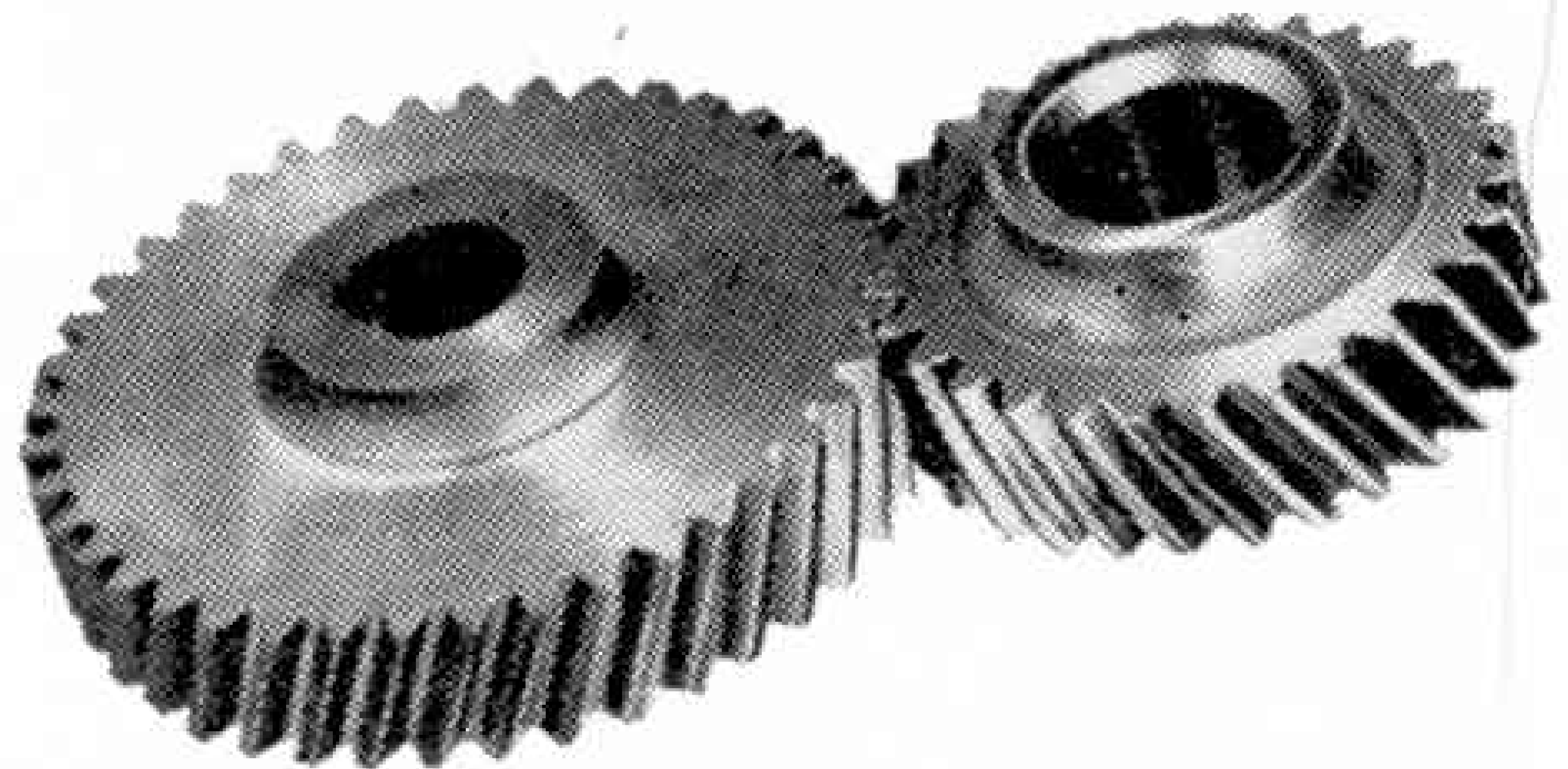
of rotation are inversely proportional to the number of teeth, e.g., if the pinion (the smaller gear) has 23 teeth and rotates at 100 revolutions and the wheel has 57 teeth the latter revolves at $\frac{23 \times 100}{57} = 40.35$ r.p.m.



2—Rack and Pinion

The pinion is the same spur type as in (1) but instead of meshing with a spur wheel it engages with a straight-toothed member called a rack.

This combination has the effect of converting circular movement into linear or reciprocating motion.

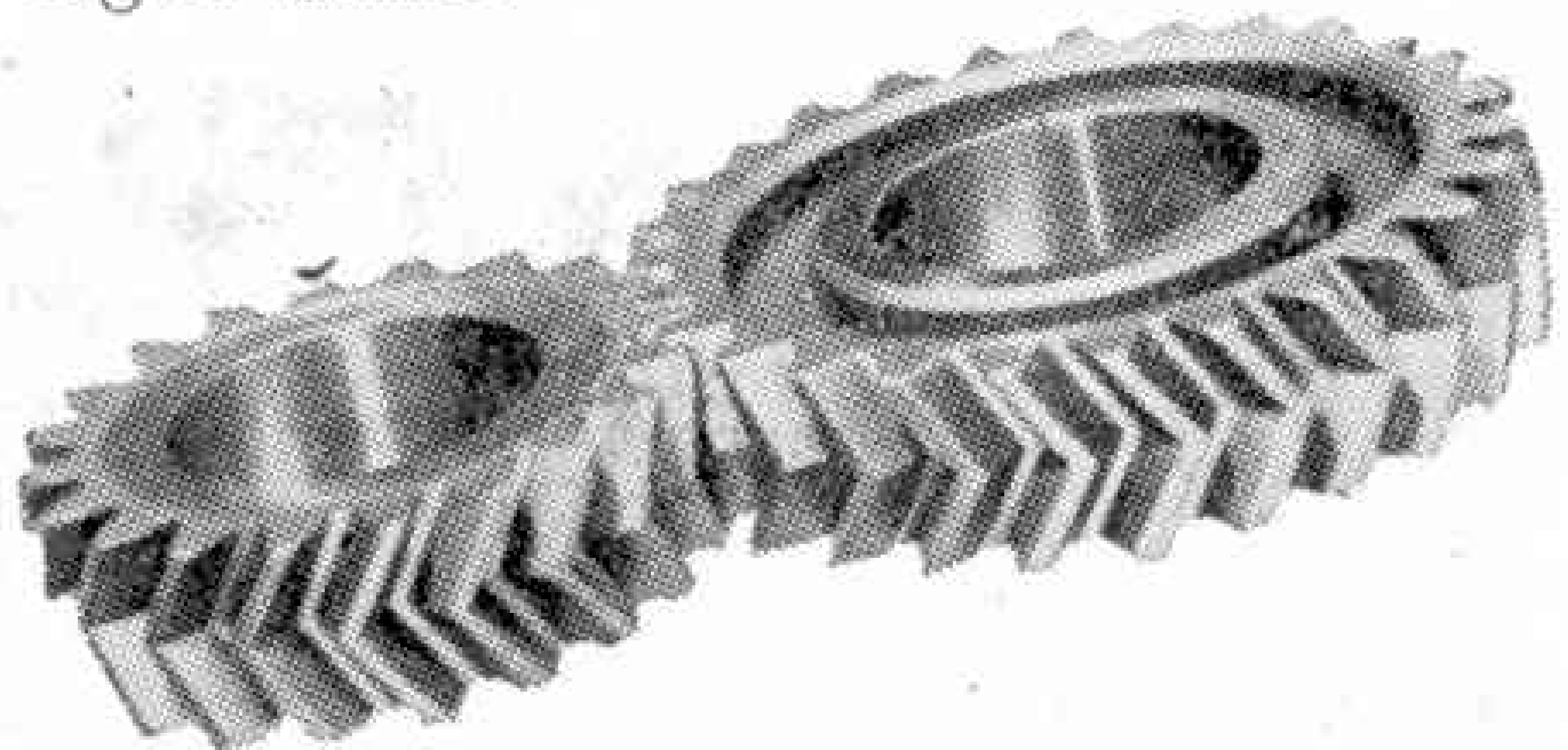


3—Single Helical Gears

The functions of single helical gears are the same as for spur gears, the difference being in the inclination of the teeth relative to the axes. The bores are parallel.

The effect of the helical teeth is a greater number of teeth in simultaneous contact than is possible with straight teeth, giving smoother and quieter running.

It should be noted that the helical teeth of the pinion are of the opposite hand to those of the wheel. In the example illustrated the pinion is left hand and the wheel right hand.



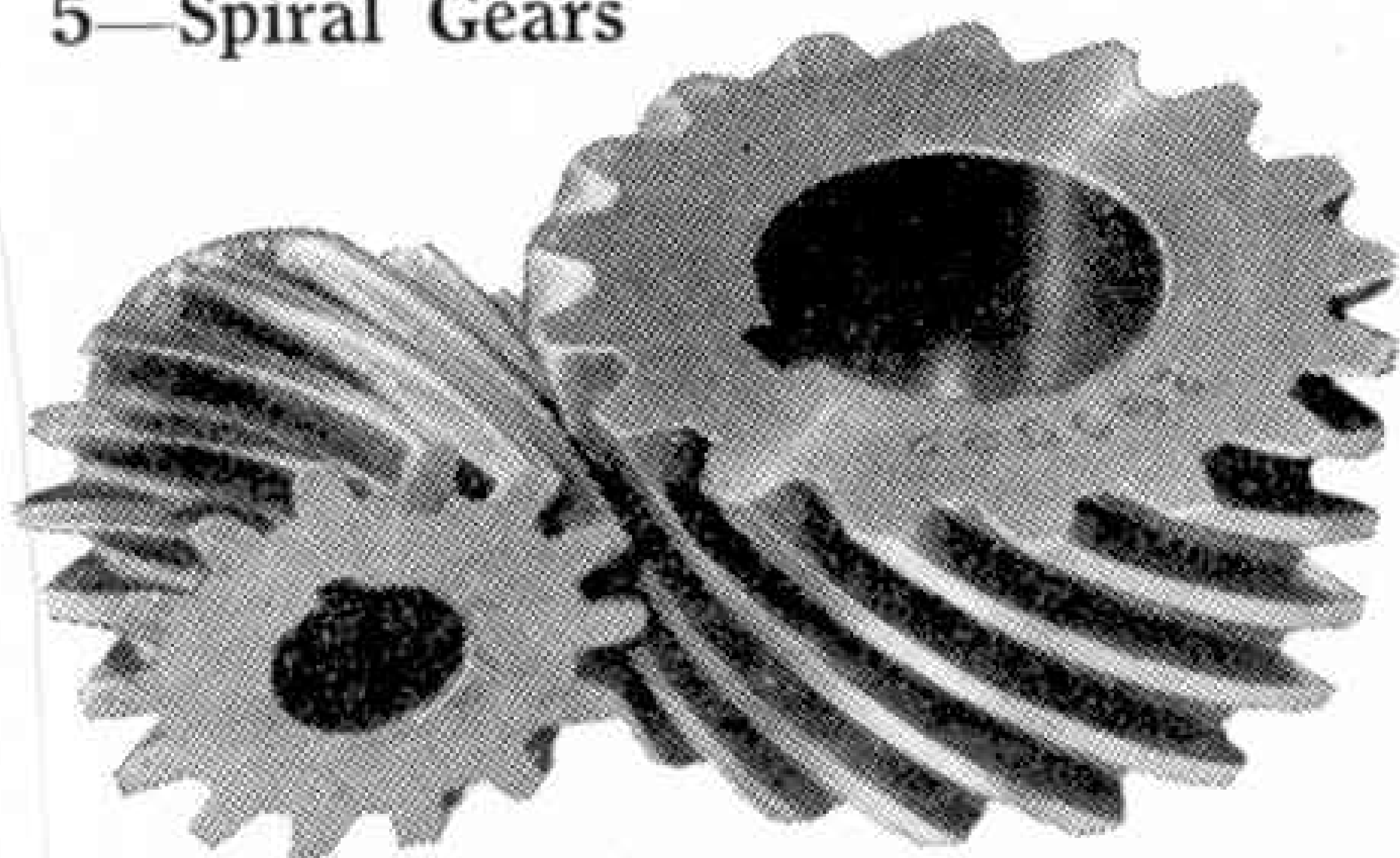
4—Double Helical Gears

Double Helical Gears are an adaptation of Single Helical Gears and are readily identifiable by the "V" formation of the teeth, bearing in mind that, with certain methods of manufacture, the "V" may not be continuous.

The advantage of this type is that the gears do not set up end thrust as obtains with Single Helical Gears.

*Reprinted, by courtesy of the Editor, from "Contact," the journal of David Brown and Sons (Hudd) Ltd. and associated Companies.

5—Spiral Gears



Viewed singly Spiral Gears cannot be distinguished from Single Helical Gears, but when examined together it will be seen that both Pinion and Wheel are the same hand—left hand in the example illustrated—with the result that when meshed together the bores are not parallel but at an angle (usually 90°).

Relative speeds can be determined by the numbers of teeth as in the case of spur gears, noting that the teeth of the pinion must not be counted across the face but round the circumference.



6—Worm Gears

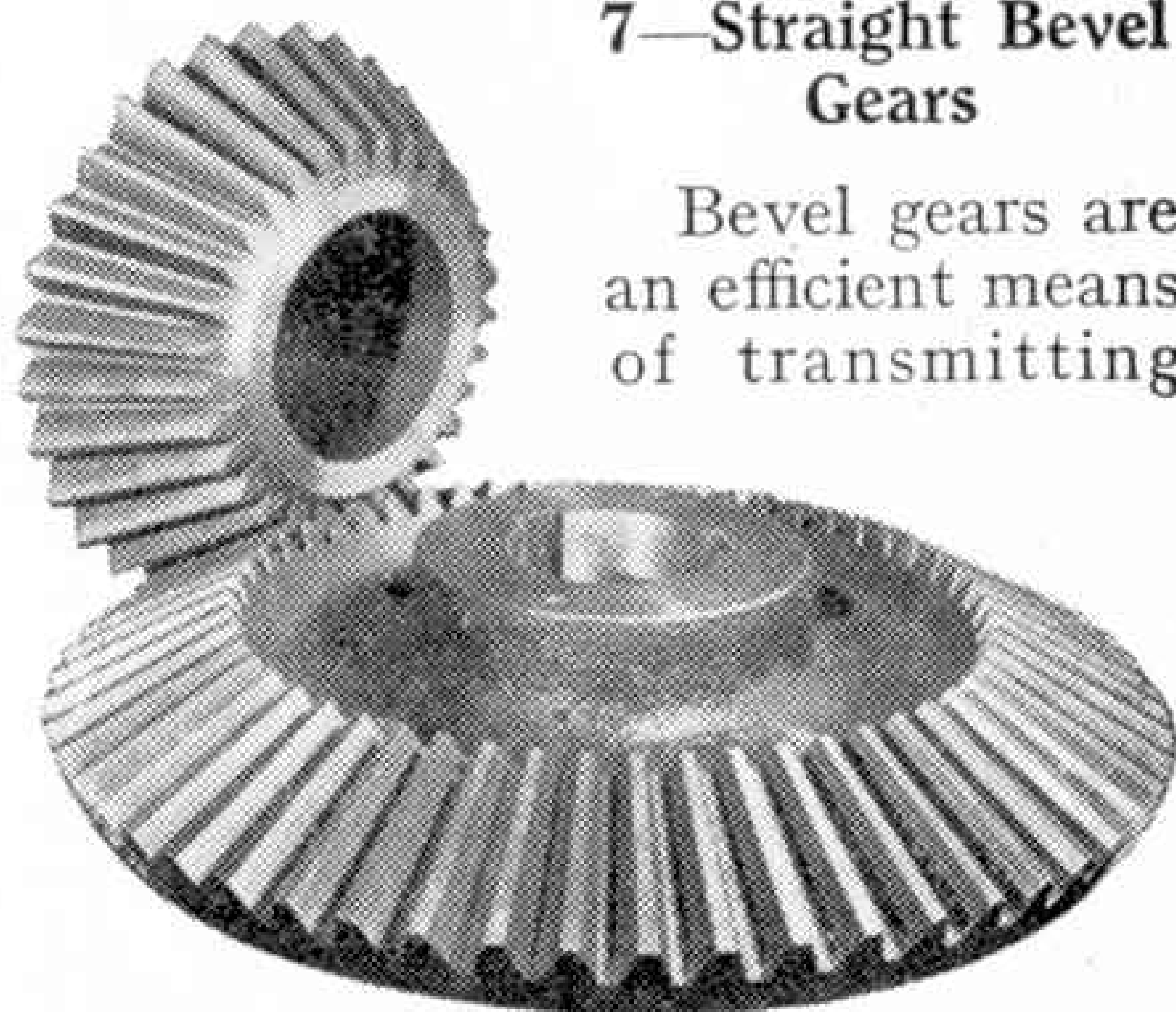
Worm Gears are a development of spiral gears, the main difference being that the wheel is hollow faced so as to envelop sufficient of the worm to give a much greater zone of contact on each tooth.

This results in a much greater load carrying capacity. These gears can frequently be identified by the worm (which is the equivalent of the spiral pinion), being of hardened steel with a high degree of finish and the worm

wheel being of bronze, which combination minimises the friction due to the sliding action as the worm thread passes the wheel teeth.

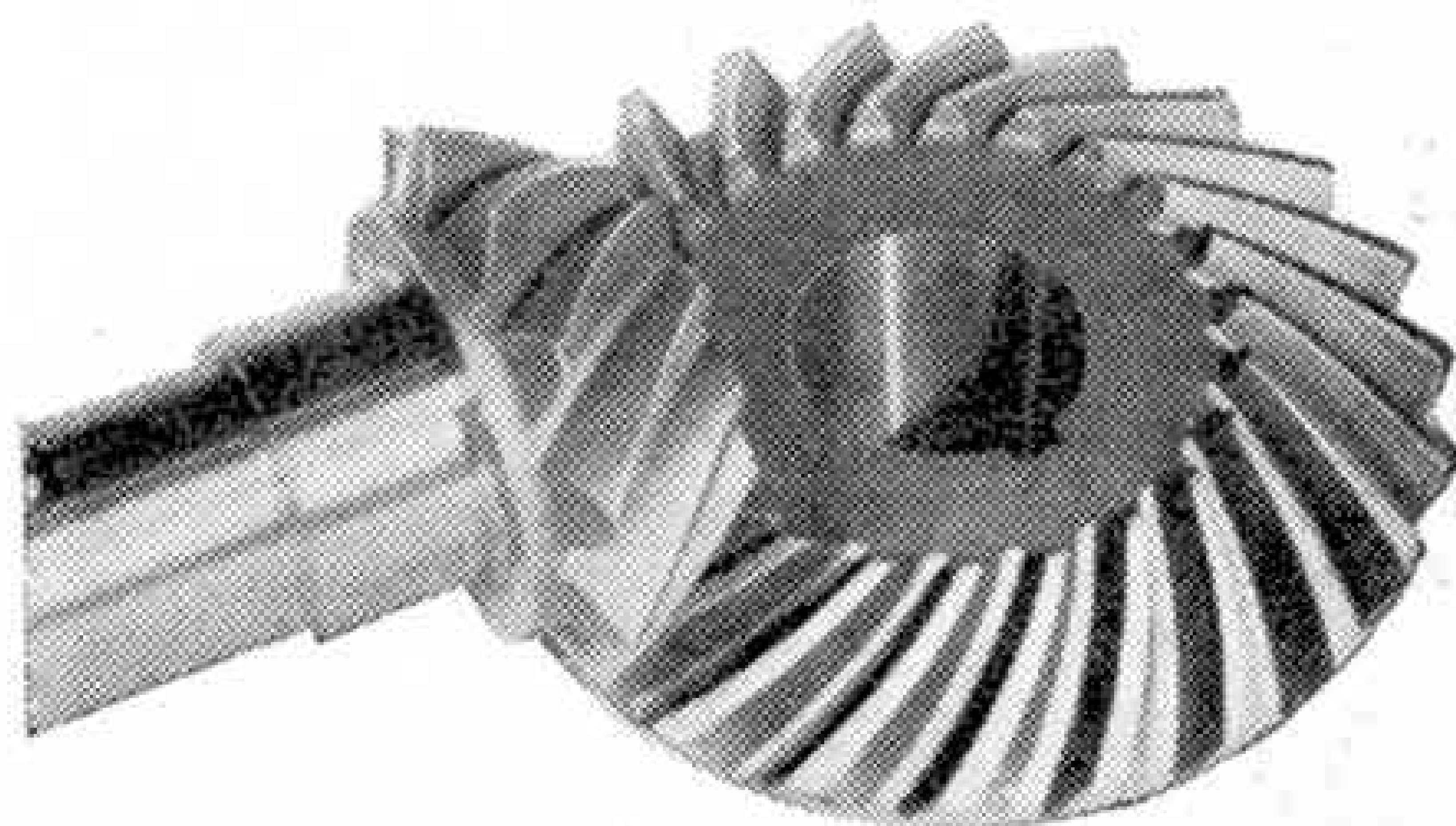
7—Straight Bevel Gears

Bevel gears are an efficient means of transmitting



power and motion between shafts which are in the same plane and disposed at an angle (usually 90°) to each other.

They are easily identified by their conical shape and tapering teeth.



8—Spiral Bevel Gears

These gears are identical in function with straight tooth bevel gears but have a spiral tooth formation to give greater strength and smoother running by the increased number of teeth in simultaneous contact.

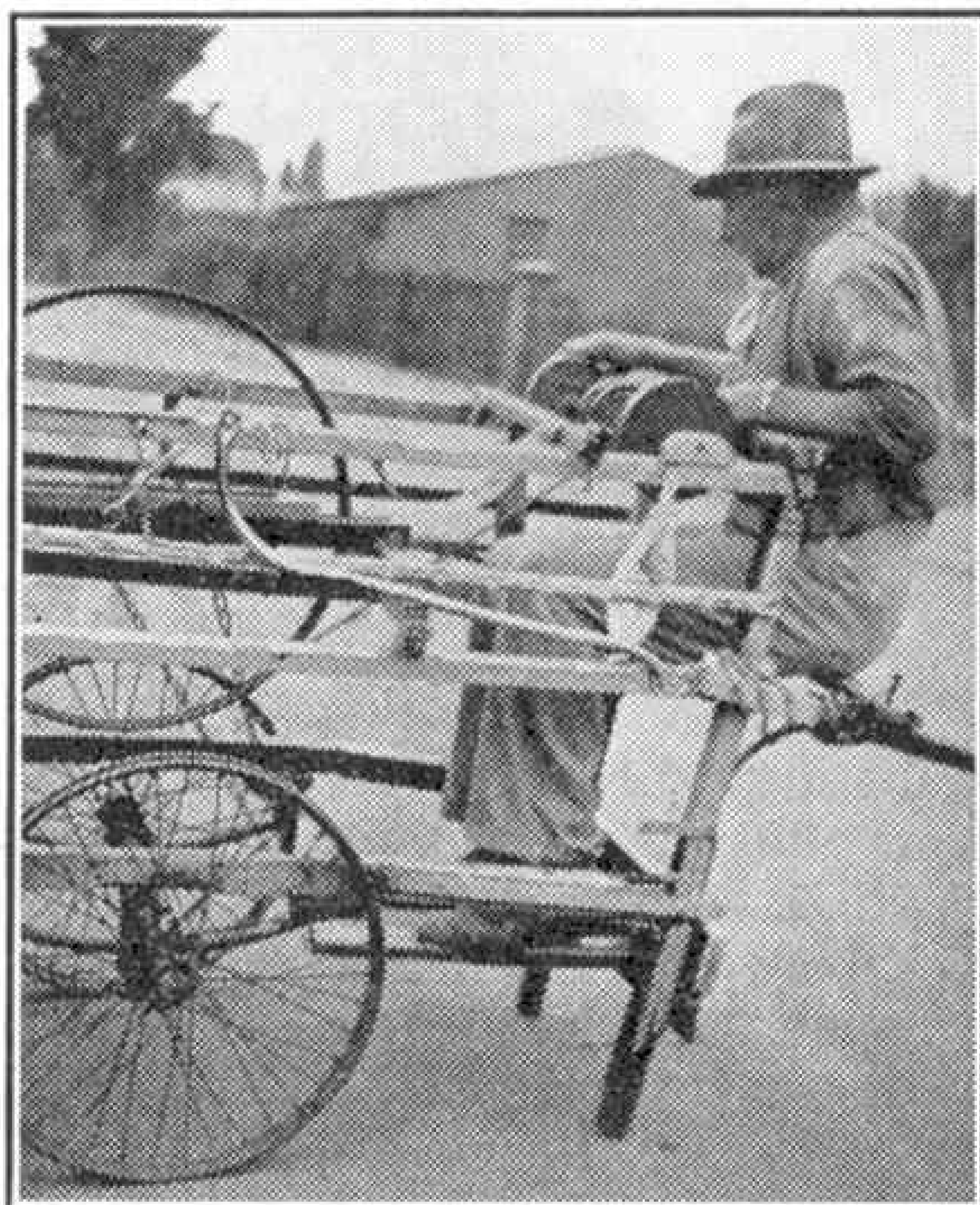
The teeth are usually, but not always, curved as this is an adaptation to suit a manufacturing process which is used for speed and accuracy of generation. It does, however, facilitate identification.

Photography

People at Work

MOST of us find it interesting to watch other people at work, especially on jobs that have no resemblance to our own. We are all familiar with the little group of spectators that gather to watch road builders or repairers at work, or to gaze at the operations of a big crane or power shovel. I recall that during the construction of the huge Rockefeller Centre in New York a wooden gallery overlooking the site was specially constructed from which those who wished could watch the building operations. This gallery was labelled "*Sidewalk Superintendents' Club*," but it also received the less dignified but certainly more expressive name of "*Gaper's Gallery*!"

It is good fun to make a collection of photographs of people at work, and even the simplest jobs will provide interesting pictures. Opportunities for this kind of photograph often come quite unexpectedly during a walk through the streets or the countryside, and it is a good plan when out "prospecting" to carry the camera ready for a quick snapshot at any moment. The exposures required naturally vary with the condition of the light and the amount of movement in the picture, but in the majority of such subjects the people concerned are moving comparatively slowly, so that a high shutter speed is seldom necessary. Generally speaking,

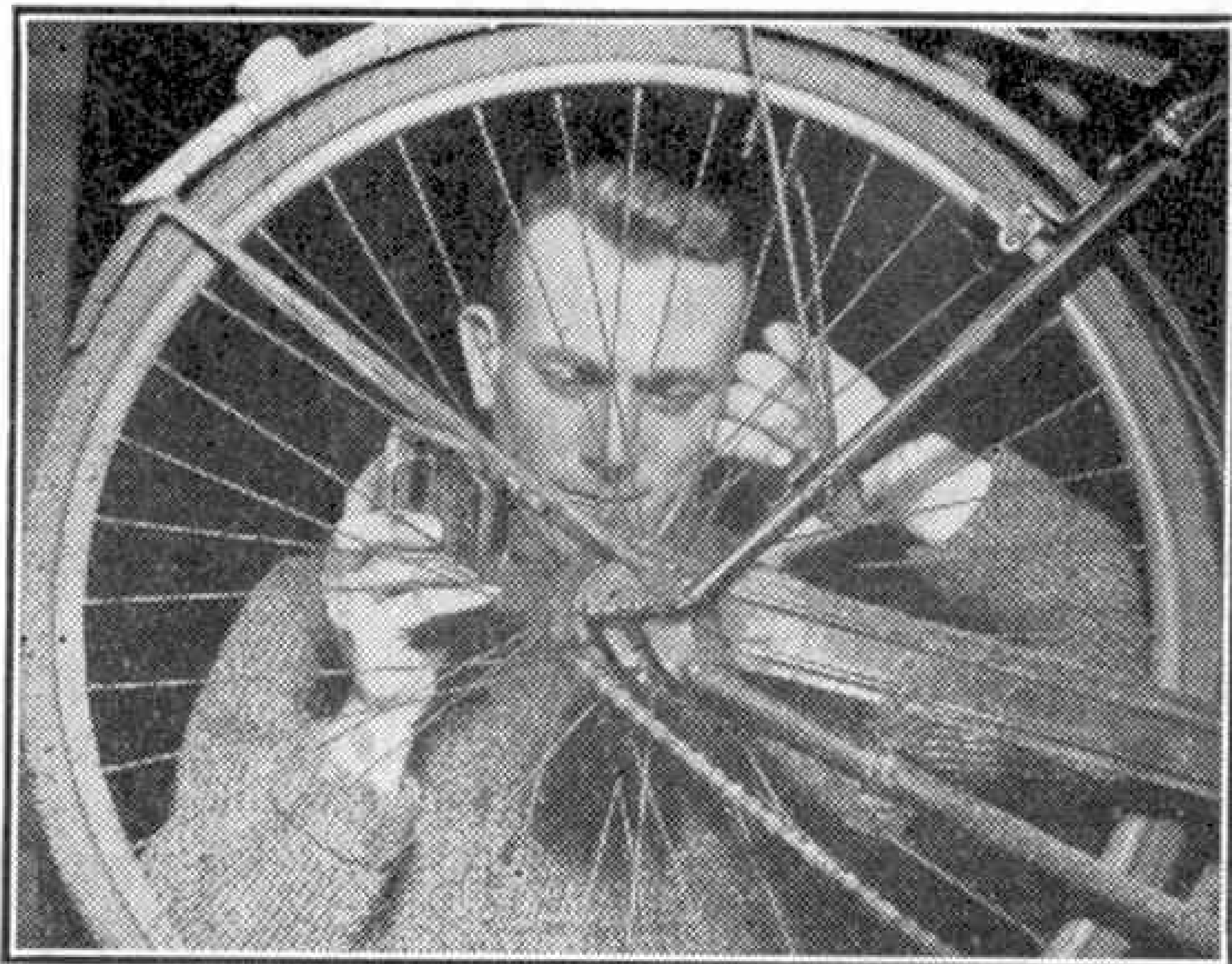


The Knife Grinder. Photograph by P. R. Wickham, Leicester.

good results can be got with a rapid film, a lens aperture of $f/8$ and the shutter working at $1/25$ th sec. Frequently there is little time for thinking about focusing, and if the camera is of the popular type in which the focusing is done by rotating the lens mount, it is a good plan to set this at 15 ft. or 20 ft.

In subjects that include a number of people one must just wait for a suitable grouping to occur. Often, however, only one person is involved, and then it may be possible to get him to keep still for a moment in the desired attitude. This was done in the accompanying picture of an itinerant knife grinder. If in such a case a print is promised, make a careful note of the address and never fail to send the print, even if it does not turn out quite as well as was hoped.

Finally, do not forget that in these wartime days photographs must not be taken of operations that have any military connection. This prohibition applies not only to the activities of the Services but also to those of the various branches of Civil Defence. In addition the photography of scenes of air raid damage is forbidden.



"Lubrication." Photographed by W. Barr, Birkenhead.

From Our Readers

This page is reserved for articles from our readers. Contributions not exceeding 500 words in length are invited on any subject of which the writer has special knowledge or experience. These should be written neatly on one side of the paper only, and should be accompanied if possible by original photographs for use as illustrations. Articles published will be paid for. Statements in articles submitted are accepted as being sent in good faith, but the Editor takes no responsibility for their accuracy.

OUT WITH A BALLAST TRAIN

My father is an engine driver and on one occasion I had the luck to accompany him to a station near by for ballasting. We left the De Aar sheds at five in the morning, and down in the yard we attached 12 wagons filled with stones for a new line that was to be laid at Orange River. That morning No. 945, our engine, showed what she could do and we covered the first 80 miles easily in the time given us.

Then came a hearty and welcome breakfast, after which the tank was refilled with water and we left for our destination, the curve in front of the big Orange River Bridge. There kaffirs were busy laying down the new rails in the just completed cutting. I wandered about in the hope of catching a glimpse of a baboon, for there are a few in the neighbourhood, but I was not successful, so I returned to lend a helping hand with unloading the stones brought for use as ballast.

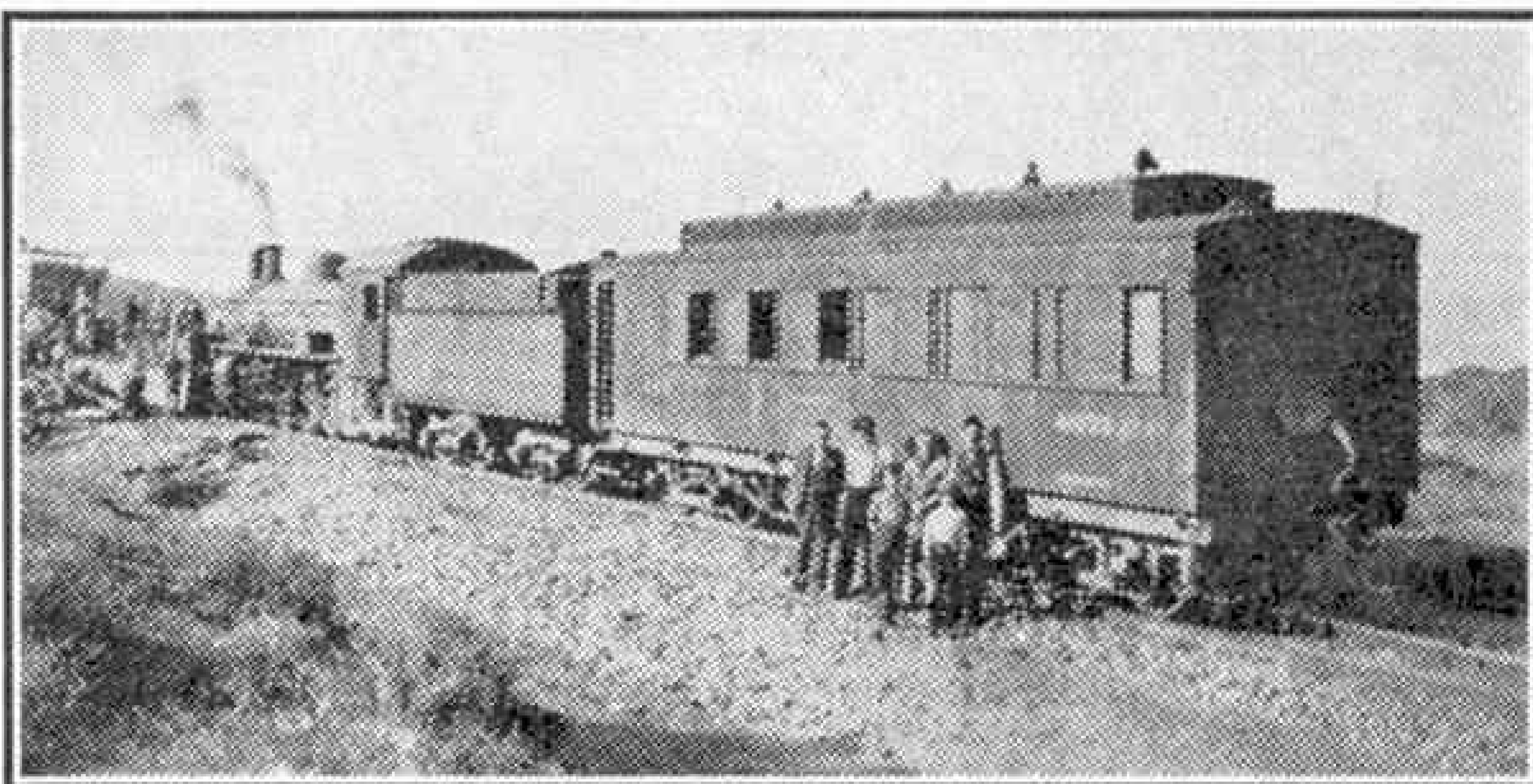
At about one we left for Orange River to enable a fast passenger train to pass. Then out we went again to work. Helping where I could made the time fly and to me it seemed that the time for departure came too soon. We reached De Aar very tired and hungry, but satisfied with a good day's work.

S. JAKOBSEN (De Aar Junction, South Africa).

YOU MUST "TAKE OFF" HERE

A curious old wayside stone at the top of a hill near

Callington, Cornwall, bears the words "Take Off." Few know what this means. The history of the stone goes back to the days when a toll-house near by did duty. A charge of 6d. was made for every horse drawing a vehicle and passing through the turnpike gates. As a special concession, however, an additional horse was allowed free passage for the purpose of helping a heavily loaded vehicle up a steep hill half a mile beyond. When the stone was reached, the driver was reminded by it to "take off" the extra



A South African ballast train and crew. Photograph by S. Jakobsen, De Aar Junction, South Africa.

horse and send it back home! If he failed to do so he would be hauled before the Courts and made to pay the penalty.

Those days are gone, but the weather-beaten, mossy-headed stone still tells everyone who travels that way to "Take Off."

LAWRENCE MAKER (Callington).

SURPRISE FOR A HIGHWAYMAN

In between the villages of Datchworth and Bramfield, in Hertfordshire, there is a post on which are inscribed the words "Clibbon's Post." I made enquiries about this, and was interested to find that it was a memorial of a local highwayman.

On 28th December 1782 a farmer went to Hertford Market and at night returned with a lot of money. In these circumstances the farmers of those days used to have a servant with a gun a little way behind in order to provide against attack. This was the case here. When the two were nearing the spot where the post is now, a highwayman of the name of Clibbon stepped out and demanded the farmer's money. He did not see the servant, who shot him as he was escaping with the money. He died on the spot where the post stands.

W. J. DULEY (Watton-at-Stone).

ANOTHER OLD FIRE ENGINE

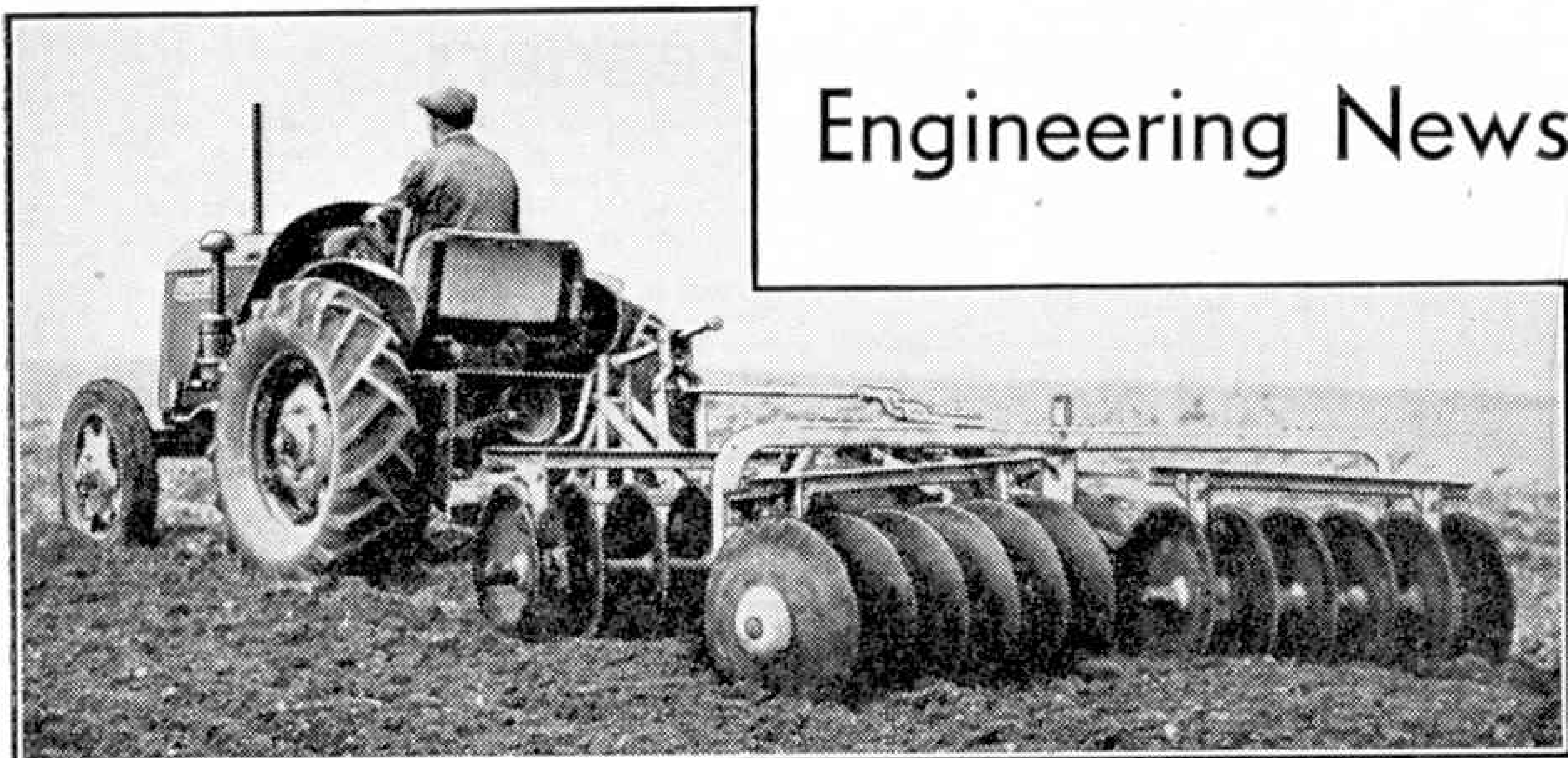
I was interested in J. W. Morton's article on the Manea fire engine in the March "M.M." On the G.W.R. Kingswear station, Devon, there is a fire engine bearing the words "Merryweather 1837," so that it is apparently older than that at Manea. It has spoked wooden wheels and the pump is operated by a T-shaped handle mounted on top of the engine. Only four men are required to work it, I believe, and it is capable of throwing a jet 50 ft. into the air.

A. J. PIKE (Torquay).



"What must I take off?" What the inscription on this stone means is explained in an article on this page. Photograph by L. Maker, Callington.

Engineering News



A "David Brown" Tractor at work with disc harrows. This photograph, by C. F. F. Snow, Braywood, Windsor, was awarded a consolation prize in the 6th seasonal Photographic Contest organised by David Brown Tractors Ltd., Huddersfield, by courtesy of whom it is reproduced. Details of a further Photographic Contest are given on page 230.

Reclaiming Metal Dust

The hard school of war has taught us the vital need for making the utmost use of all raw materials, and salvage is playing a very important part in this. One of the firms that even in pre-war days possessed a widespread salvage scheme was the Ford Motor Co. Ltd. At their works at Dagenham every possible use is made of every scrap of waste, and very effective schemes for reclaiming this have been worked out.

A particularly interesting part of the Ford factory is what is known as the sintering house, the special purpose of which is to reclaim such materials as metal borings and filings from the machine and other shops, and iron ore dust. In their original form these are too fine to be used in the blast furnace, because the fierce draught of air through this would immediately blow them out. In the sintering house therefore they are made into a heavy sinter or clinker, which can be used effectively in the blast furnace. The waste metals to be reclaimed are fed from hoppers on to a grate that is similar to the chain grate stoker of a boiler. As they travel over the grate they are roasted by means of gas jets, and combine with coke breeze to form a mass of clinker. When cold this is broken into pieces of a size suitable for handling, and heavy enough not to be blown out of the furnace by the hot air blast.

Even the very fine ore dust in the blast furnace gases can be reclaimed in this manner. The furnace is water cooled, and the cooling water is used also to cleanse the blast furnace gases. After it is used for this purpose the water contains a high percentage of solid matter. To reclaim this it is drawn off into a large circular tank with a conical base, where the solid matter is allowed to settle, so that large slowly rotating blades can sweep it into a pipe. Through this it is pumped to a suction filter, where the water is taken out. The remaining sludge can be roasted in the sintering plant. Every day three tons of solids are reclaimed by this means.

Sand is another valuable material that is recovered at Dagenham for further use. Many tons of it are used in the foundry in making the moulds into which molten metal is poured. After use it is collected by means of a belt conveyor running beneath the moulding machines, and passed through magnetic separators

for the removal of "tramp" iron, small particles that cling to it when the castings are removed from the moulds. The clean sand is then carried to the mixing units and hoppers that feed the new sand on to conveyors, while the metal particles removed in the separator make up some of the minute scrap treated in the sintering plant.

At the Dagenham works there is a special salvage department, the duty of which is to devise ways and means of making savings. Every scrap of wood, rubber, metal, cloth or leather is saved, no matter how small. Even scraps of paper discarded by workmen are reclaimed and baled for repulping.

A New Type of Rock Crusher

Many types of rock and gravel crusher have been described from time to time in the "M.M." In practically all of these the material is made to pass between heavy jaws, one of which is movable and works backward and forward against the other in order to break up the rock and stone. Hardened steel alloys are used in making the heavy jaws of these breakers, which have to bear enormous strains.

Now an entirely new form of crusher has been introduced in the United States for making sand and fine gravel. It is called the impact breaker, and the stones or gravel used are broken down by simply throwing them at high speed against breaker plates. These are made of manganese steel, and the broken material is carried forward to a screen where it can be graded. The new machine has a very high output, but maintenance costs are high as the breaker plates need to be renewed daily.

Soldering Made Easy

A neat wire soldering unit for giving strong and electrically efficient connections has been brought into use in America. It is called the jigger. Each unit contains a sufficient quantity of solder and flux, packed in a waterproof casing of inflammable material. The wires to be joined with its aid are thrust into it, and the casing is ignited. This gives sufficient heat to melt the solder and cause it to flow over the ends of the wires, and the burned casing then drops off, leaving a cleanly soldered joint. With the jigger wires can be permanently connected more easily and quickly than with a soldering iron.

Fighting Fire Bombs

During air raids on this country hundreds of thousands of incendiary bombs have been extinguished by means of sandbags or stirrup pumps, but more rapid and effective means of dealing with them have also been worked out. A particularly interesting scheme is that of the Nuswift Engineering Company Ltd., Elland, in which a finely divided spray of water is directed on to the bomb under pressure. The pressure is supplied by a reservoir of compressed carbon dioxide, which itself is effective in extinguishing fires. Further, the rapid expansion of the gas on release makes the spray very cold indeed, and this also is helpful in checking the ravages of fire.

The standard Nuswift extinguisher, known as the R.S.Q., has a cylinder holding two gallons of water, to which a 42 ft. length of flexible hose provided with a nozzle is attached. Inside the cylinder is a small copper canister containing carbon dioxide under pressure. The cylinder is brought into operation by a slight blow on the knob on the top. A sharp point then penetrates the thin cover of the canister and releases the gas into the water, thus giving a high-pressure jet of a mixture of gas and water which is sprayed out through a pipe reaching to the bottom of the cylinder. The jet is 30 ft. in length and more powerful than that of the stirrup pump.

In order to make the R.S.Q. extinguisher even more effective a scheme has been developed to enable one man to carry two cylinders, thus making him more efficient in fire fighting than two stirrup pump teams. Our illustration shows how this is done. The cylinders are suspended from a heavy belt worn by the user, who approaches the fire, stoops down so that the cylinders rest on the ground, and gives a sharp blow on the top of each cylinder. This releases two powerful extinguishing jets, which can be used for any type of fire, their finely divided spray making them particularly valuable for incendiary bombs of the thermite type.

The extinguisher can readily be recharged with water, in the case of a ship by simply being slung overboard on the end of a rope, and a new canister of carbon dioxide can be inserted in about 30 seconds. When one fire is put out the jets can be stopped by bending the hose over, ready for release on approaching a second. R.S.Q. extinguishers of other sizes and capacities are available.

A Giant Swedish Aerial Ropeway

What is believed to be the largest aerial ropeway system in the world in regard to carrying capacity has been completed recently in Sweden. Its purpose is to transport limestone over a distance of 26 miles to a new cement factory, and the carrying capacity of the 510 conveyors now used is 63 tons an hour. Later this will be increased to 90 tons an hour.

The ropeway is built in four sections, each about six miles long, and is carried on 235 concrete columns. At one point the line crosses a river, where a clear height of 85 ft. had to be allowed, and in order to achieve this columns 108 ft. in height were built on the two banks, 492 ft. apart. The ropeway also crosses a lake, over which it passes for a distance of about two miles, and there several columns 148 ft. in height had to be built up in the water, the greatest span being 591 yds.

Each section has its own driving machinery. Electric motors are used, two at the middle station and one each at the end stations, and their total output is 540 h.p. They are coupled so that they can be started simultaneously.

Before the ropeway was built the possibility of carrying the limestone by rail, canal and road was considered. All these proved to be more costly than a ropeway, and a canal would have had the further difficulty of being unusable for four months every year owing to freezing. The conveyors occupy a little more than 4½ hrs. to complete their journey and the cost of carriage is slightly more than one shilling a ton, a sum that will be halved after the line has been in use for 10 years.



How two R.S.Q. fire extinguishers are carried. One man so equipped is more effective than two stirrup pump teams. Photograph by courtesy of Nuswift Engineering Co. Ltd., Elland.

A Large American Dry Dock

Water is one of the chief enemies of the civil engineer, and the building of a large dry dock recently in the United States illustrates both the extent of the trouble that water can give and the efficiency of the methods used in dealing with it.

The dock is 1,200 ft. long and 150 ft. wide, and it was built on a site covered with water to a depth of 20 ft. The plan followed was to enclose the area by means of an embankment, and then to pump it dry. There was a very heavy flow of underground water, however. In order to deal with this wells or shafts 2 ft. 6 in. in diameter were drilled, and within each a pump with a capacity of 2,000 gall. per min. was sunk. Each pump was driven by a motor specially designed to work when immersed. About 36 wells were required to cope with the flow of water, amounting at times to 36,000 gallons a minute.

The water from the pumps was delivered through check valves to main pipes along the sides of the enclosed area. As the water level was lowered, lines of well points were drilled to drain the side slopes, the number of those used for this purpose being about 1,600. These wells were arranged in groups to serve the pumping apparatus installed.

When the site had been pumped dry, the bottom was 60 ft. below water level. On this a layer of gravel 1 ft. 6 in. in depth was placed and over it was laid a concrete floor 3 ft. 6 in. in thickness. The concrete was delivered in buckets with opening bottoms, and of 8 cu. ft. capacity. These were brought into position by means of cableways or ropeways, with spans of 830 ft., carried on towers running on track of 30 ft. gauge.

Suggestions Section

By "Spanner"

(552) Worm Gear Tester ("Spanner")

Some form of reduction gearing is required in almost every instance in engineering where it is desired to use an electric motor for driving a machine. Its purpose is to produce a slower and more powerful drive from the comparatively high speed of the armature shaft of the motor.

One of the most efficient and compact forms of gearing is the worm and pinion. In designing this it is necessary beforehand to compare the maximum load that can be placed on the output shaft of the gear-box while the shaft is rotating at the speed required, with the power necessary to drive the machine. This load is measured by connecting the worm gear unit to an electric motor and Prony brake attached to a spring balance, as explained in the article on the testing of a worm gear unit that appeared on page 93 of the March "M.M."

Figs. 552 and 552a show a model that demonstrates the working of the apparatus described in this article. The model is carried on a base that consists of a $5\frac{1}{2}" \times 2\frac{1}{2}"$ Flanged Plate lengthened $2\frac{1}{2}"$ at one end by a $2\frac{1}{2}" \times 2\frac{1}{2}"$ Flat Plate attached to it by $\frac{1}{2}" \times \frac{1}{2}"$ Angle Brackets, Corner Angle Brackets and two $5\frac{1}{2}"$ Strips. The base is completed by bolting a $2\frac{1}{2}"$ Angle Girder to the outer end of the $2\frac{1}{2}" \times 2\frac{1}{2}"$ Flat Plate. An E1 or E120 Electric Motor is fitted to the base in the position shown and the special pinion mounted on its armature shaft meshes with a 57-teeth Gear fixed on a $2\frac{1}{2}"$ Rod 1. The Rod is journalled in

the sideplates of the Motor and carries a Universal Coupling 2, in the other end of which is a $2"$ Rod on which is fixed a Worm. The bearings for the $2"$ Rod are provided by a $2\frac{1}{2}"$ Strip and a $2\frac{1}{2}" \times 1\frac{1}{2}"$

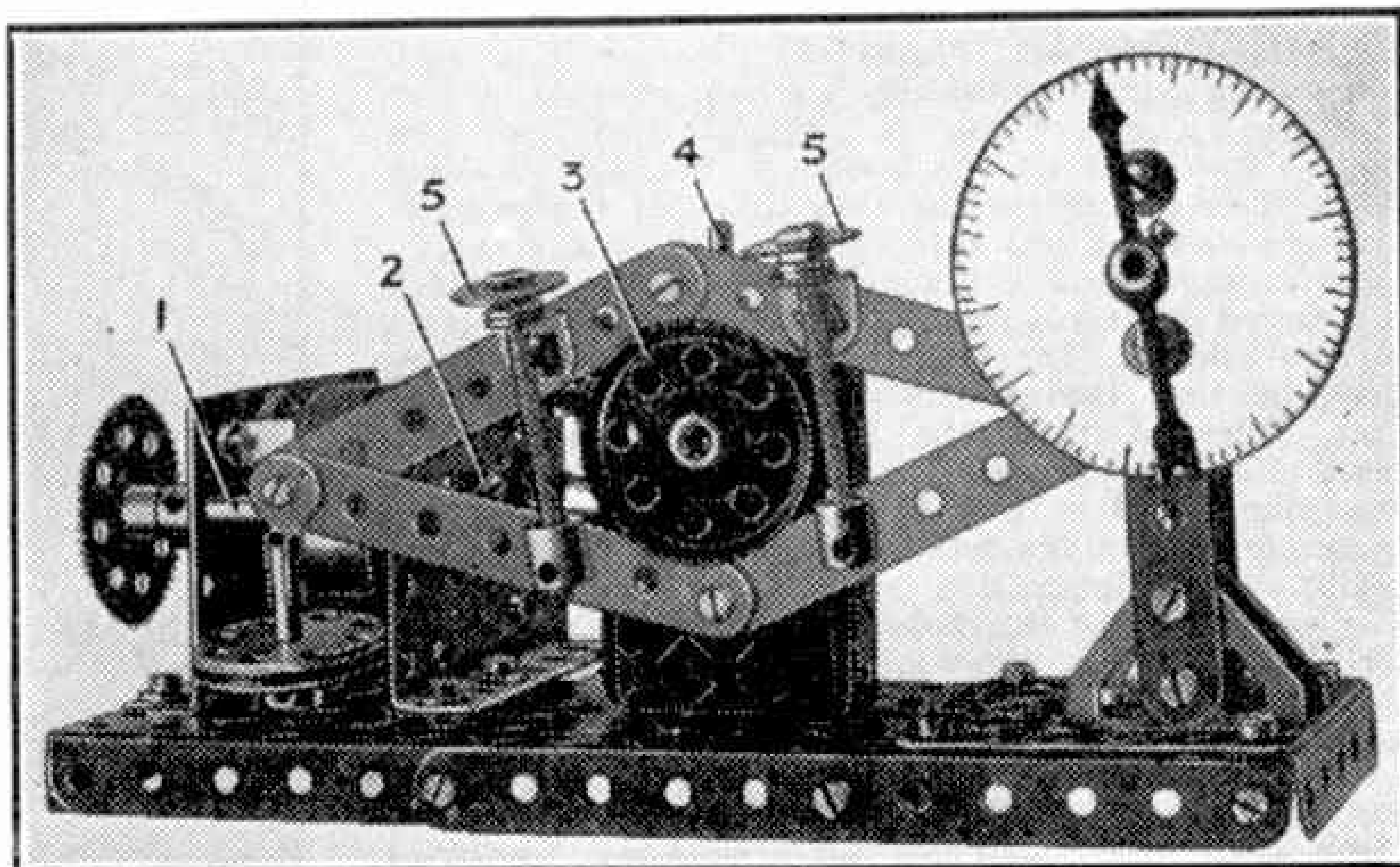


Fig. 552.

Double Angle Strip attached to two $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flanged Plates that form the gear-box casing for the worm gear.

Before the $2\frac{1}{2}"$ Strip is fixed in place the worm wheel is fitted in the gear-box. This consists of a $\frac{1}{2}"$ Pinion mounted on a $1"$ Rod that is journalled in the $2\frac{1}{2}" \times 1\frac{1}{2}"$ Flanged Plates and also carries a $1\frac{1}{2}"$ Pulley 3 forming the drum of the Prony brake. A Threaded Pin 4, representing a thermometer, is now secured to the gear-box casing. The purpose of this in the prototype is to measure the temperature of the oil inside.

The brake shoes are four $3\frac{1}{2}"$ Strips lock-nutted to one another and engaging the groove in the Pulley 3. The outer ends of the shoes are also lock-nutted to Rod and Strip Connectors. The shoes are tightened round the drum by turning two hand-wheels 5, each consisting of a $\frac{3}{4}"$ Disc fixed on the

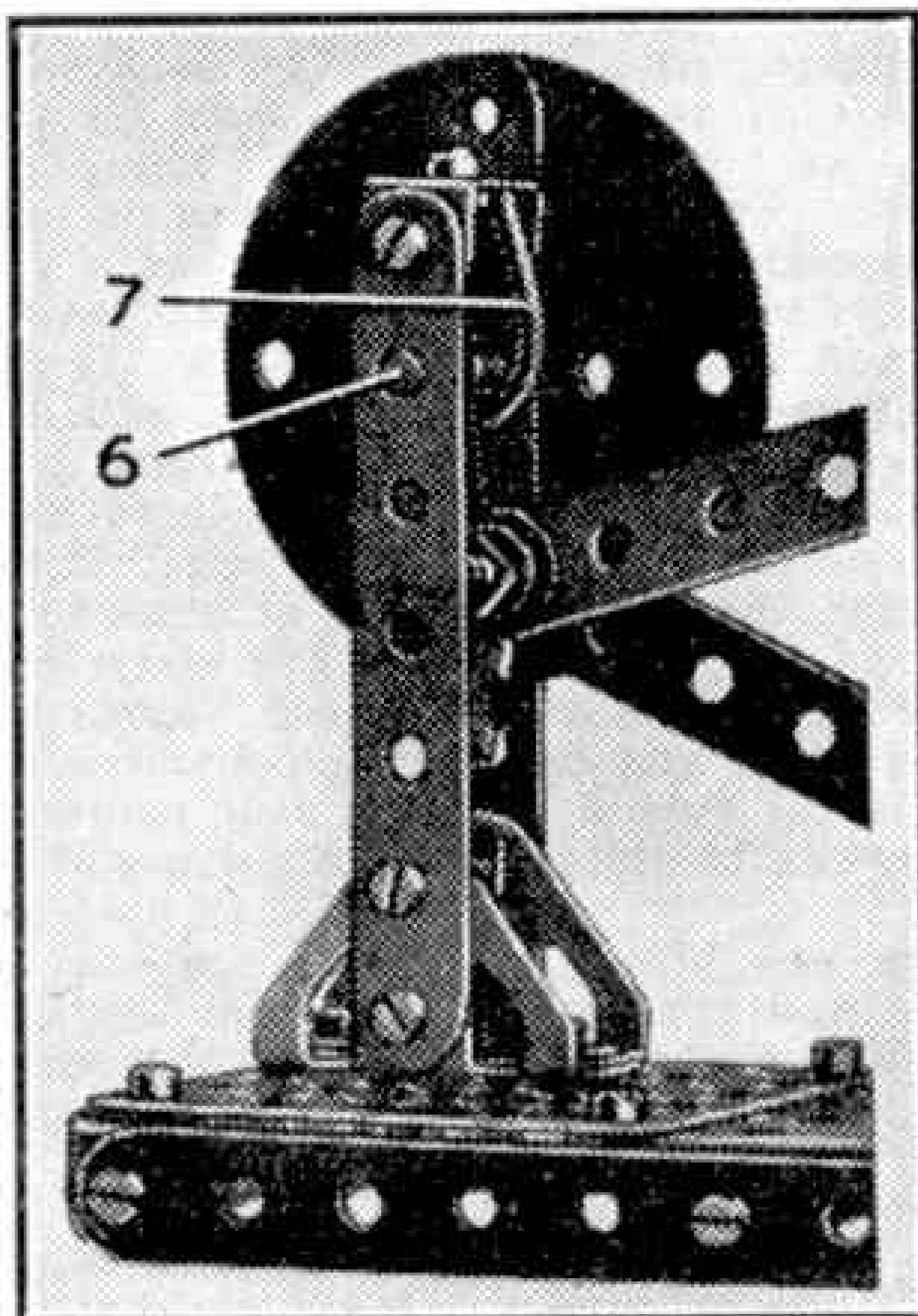


Fig. 552a.

upper end of a 2" Screwed Rod. Each of the two Rods is mounted in a $\frac{1}{2}" \times \frac{1}{2}"$ Angle Bracket bolted to one of the upper $3\frac{1}{2}"$ Strips and in a Threaded Boss attached to the corresponding lower $3\frac{1}{2}"$ Strip.

A known weight must be suspended from one arm of the brake shoes. In the model this consists of several $1\frac{1}{4}"$ Discs placed on a 1" Rod inserted in the Rod and Strip Connector attached to the arm and kept in position by a Collar. The other arm is attached to a spring balance that is mounted in two $3\frac{1}{2}"$ Strips fixed to the base by two Trunnions. These Strips are attached to a Double Bracket at their upper ends. The scale is made from a small piece of cardboard that is attached to two Semi-Circular Plates bolted to the front $3\frac{1}{2}"$ Strip. A length of Cord is fastened to the arm, passed around a 1" Rod 6, Fig. 552a, and is finally tied to a Cord Anchoring Spring mounted on the Rod. A short length of Spring Cord 7 is bolted to the Double Bracket attached to the $3\frac{1}{2}"$ Strips, wound once around the Rod 6 and connected to the Cord Anchoring Spring. A Pointer fixed on the front end of the Rod indicates the weight that has to be added to the known weight attached to the other arm to give the total load that is placed on the drum. Vibrations are damped by a 1" Rod fitted in the second Rod and Strip Connector and a Double Bent Strip bolted to the base.

(553) Forward Control Steering Gear for Heavy Lorries ("Spanner")

The increased power of motor lorries, and the consequent possibility of carrying heavier and sometimes very bulky loads, has necessitated longer chassis to accommodate the bodies. This in turn has introduced problems connected with the steering arrangements, but in some cases these difficulties have been overcome by making the engine unit as compact as possible and arranging the steering gear in a forward control position.

Such a steering gear suitable for incorporation in models of heavy lorries is shown in Fig. 553. The gear is of the worm and pinion type, and consists of a Worm mounted on the steering column and meshed with a $\frac{1}{2}"$ Pinion fixed on a 1" Rod that carries also a Crank 1. Bearings for the two Rods are provided by two 2" Flat Girders, which are bolted to the framework of the chassis and are attached to 2" Strips and Double Brackets. At its lower end the Crank 1 is lock-nutted to an End

Bearing, which is connected by a 1" Rod to a Swivel Bearing 2. The latter is fixed by its "spider" to a Handrail Support 3 mounted on the upper end of a $1\frac{1}{2}"$ Rod journalled in a $5\frac{1}{2}"$ compound channel girder 4. The channel girder is attached to the springs of the chassis, and the $1\frac{1}{2}"$ Rod carries a Handrail Coupling 5, in which is gripped the stub axle supporting the right-hand road wheel.

A Coupling 6 mounted on the former Rod forms one of the radius arms. This is connected by a 1" Rod to a Swivel Bearing connected to a second Swivel Bearing by a 4" Rod. The second of the two Swivel Bearings is attached by a 1" Rod to a Coupling 7 that forms the second radius arm. A Handrail Coupling fixed to the 1"

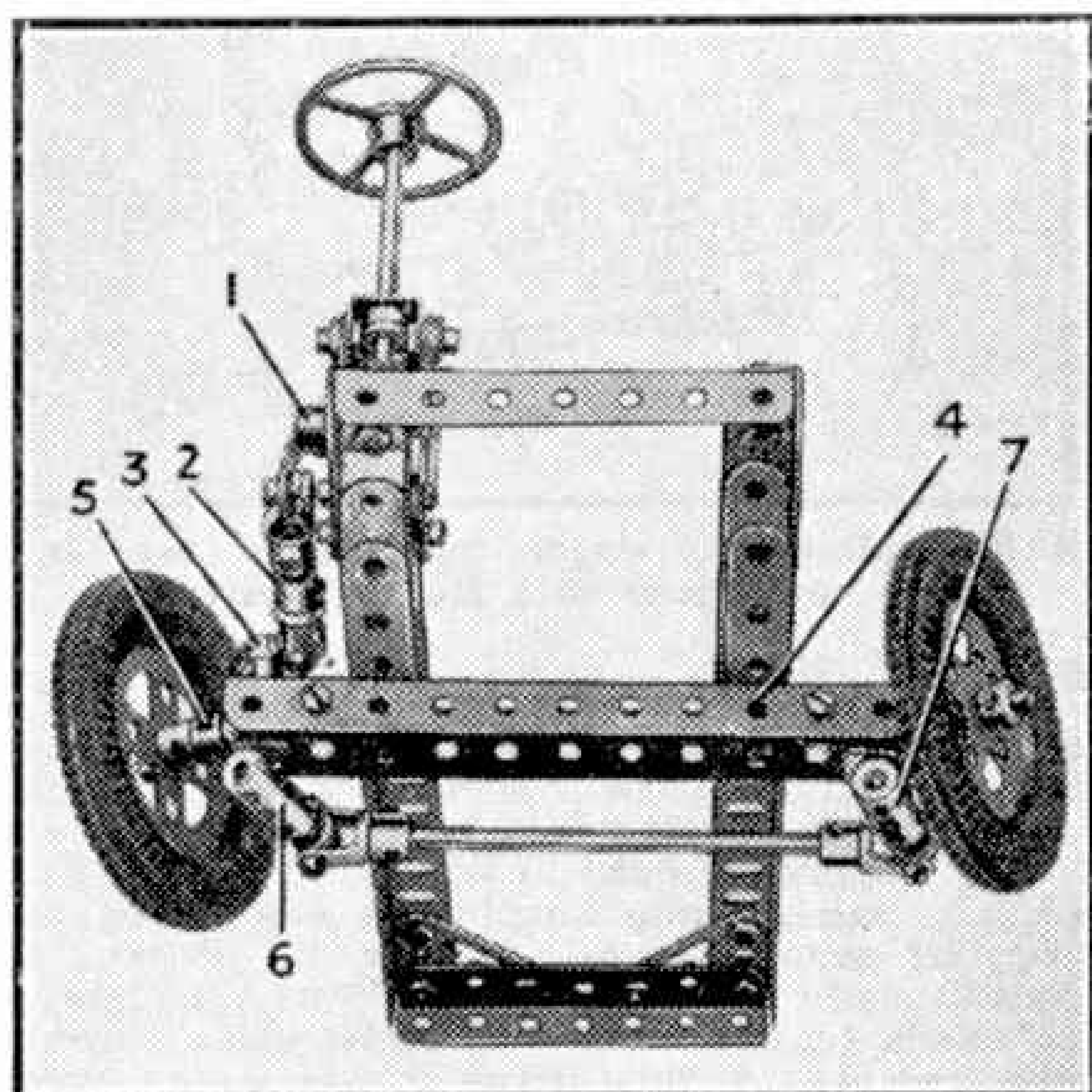


Fig. 553.

Rod secured in the transverse bore of the Coupling 7 carries the left-hand stub axle and road wheel.

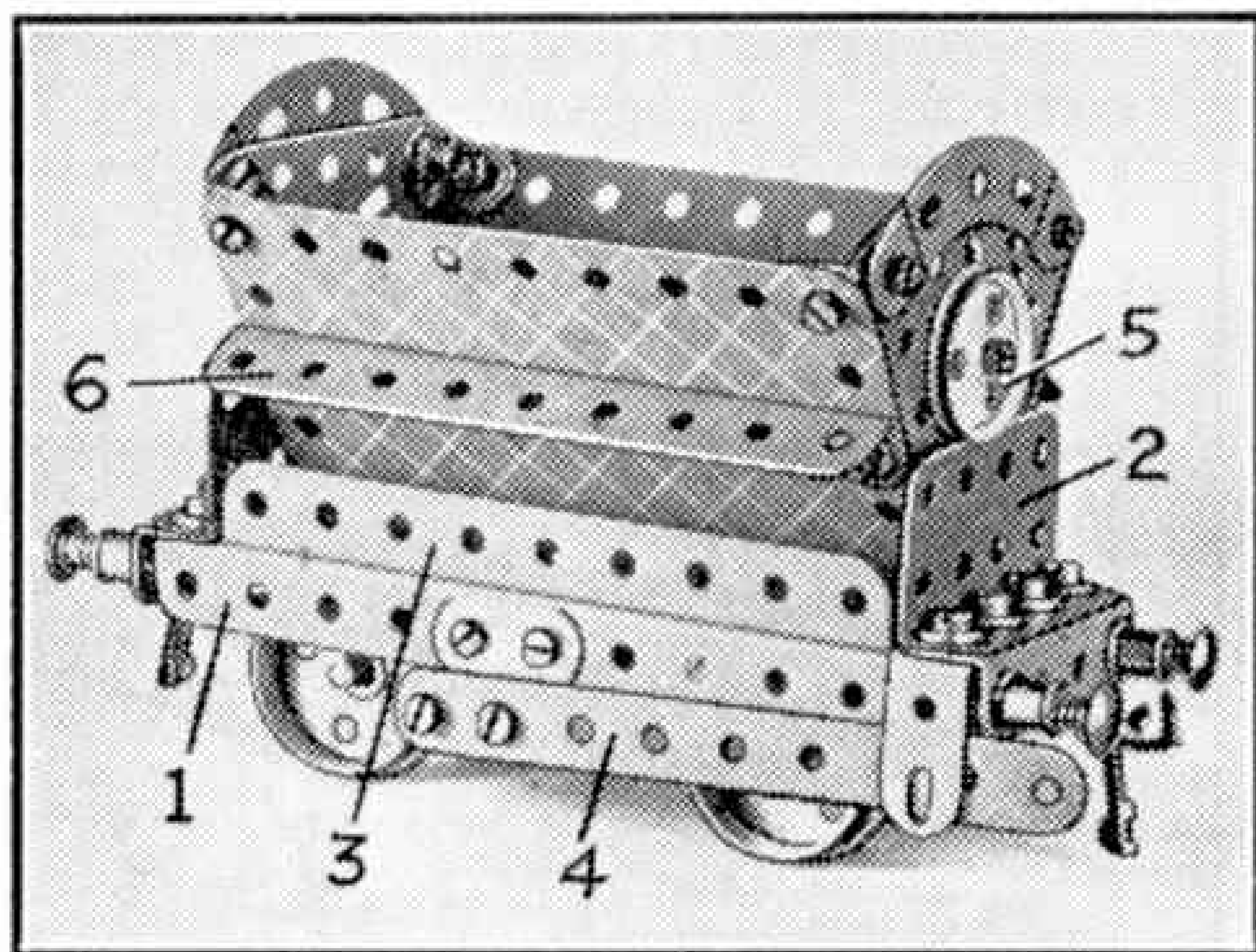
(554) Novel Use for the Meccano Drift ("Spanner")

In assembling delicate and sensitive mechanisms it is essential to reduce friction to a minimum. This applies particularly to rotating rods and their bearings. Sometimes the Meccano Drift, part No. A1083, will be found useful in this respect, for it can be used in conjunction with a Rod Socket to provide a very free-running shaft. The Drift may be arranged either vertically or horizontally, and the pointed end is pivoted in the bore of a Rod Socket fixed to the frame of the mechanism. At the other end of the Drift the bearing may be provided by a hole in a Plate or other suitable part.

New Meccano Models

Side-Tipping Rail Wagon and Crushing Mill

THE first of our new models this month is a side-tipping wagon of the type used on small gauge railways, such as those in coal mines and quarries, where the load is tipped by hand. This model is shown in our upper illustration. It is simple to make, but can be used in actual operations on a Hornby



A fine side-tipping wagon that can be used in actual operations on a Hornby Railway.

gauge "0" railway.

The construction of the tipping wagon is commenced with the chassis. Two $5\frac{1}{2}$ " Angle Girders 1 are spaced apart at their ends by 2" Angle Girders, and a Girder Bracket 2 is bolted on at each end. Spring Bolters are fixed to the ends of the 2" Angle Girders, and a Train Coupling is lock-nutted to a Coupling secured to each of the 2" Girders. The travelling wheels are $1\frac{1}{2}$ " Flanged Wheels mounted on $1\frac{1}{2}$ " Rods journaled in Trunnions which, together with two $4\frac{1}{2}$ " Angle Girders 3, are bolted to the Angle Girders 1.

A brake is fitted to one pair of wheels and consists of a lever 4 formed from a $4\frac{1}{2}$ " Strip lock-nutted by means of a $\frac{3}{8}$ " Bolt to a 1" Triangular Plate bolted to the chassis. The $\frac{3}{8}$ " Bolt is also secured to one end of a Threaded Boss fixed to a 2" Screwed Rod, which is journaled in another 1" Triangular Plate attached to the chassis, and carries a Flat Bracket locked on it between two Nuts. The brake shoes are Collars bolted to the Flat Bracket and the lever 4 by $\frac{3}{8}$ " Bolts.

The container consists of a Hinged Flat Plate attached at each end to $2\frac{1}{2}$ " Triangular Plates, to the centre holes of which 1" loose Pulleys 5 are bolted. These Pulleys run along the upper edges of the Girder Brackets 2. A $4\frac{1}{2}$ " Angle Girder 6 is bolted to each hinge of the Hinged Flat Plate in the position shown. When the container is tipped to one side the Girder 6 fits over the flange of the Girder 3 and its boltheads lock it in position by engaging the latter Girder.

Parts required to build model side-tipping wagon: 1 of No. 2a; 2 of No. 9; 4 of No. 9a; 2 of No. 9e; 1 of No. 10; 4 of No. 12; 1 of No. 12b; 2 of No. 18a; 4 of No. 20; 2 of No. 22a; 37 of No. 37a; 34 of No. 37b; 28 of No. 38; 2 of No. 59; 2 of No. 63; 1 of No. 64; 2 of No. 76; 2 of No. 77; 1 of No. 81; 2 of No. 90a; 2 of No. 111a; 3 of No. 111c; 4 of No. 120a; 2 of No. 121; 4 of No. 126; 2 of No. 161; 1 of No. 198.

Mills of the type represented by the model shown in the lower illustration on this page are used for crushing and grinding materials required in brick-making. The model demonstrates the movements

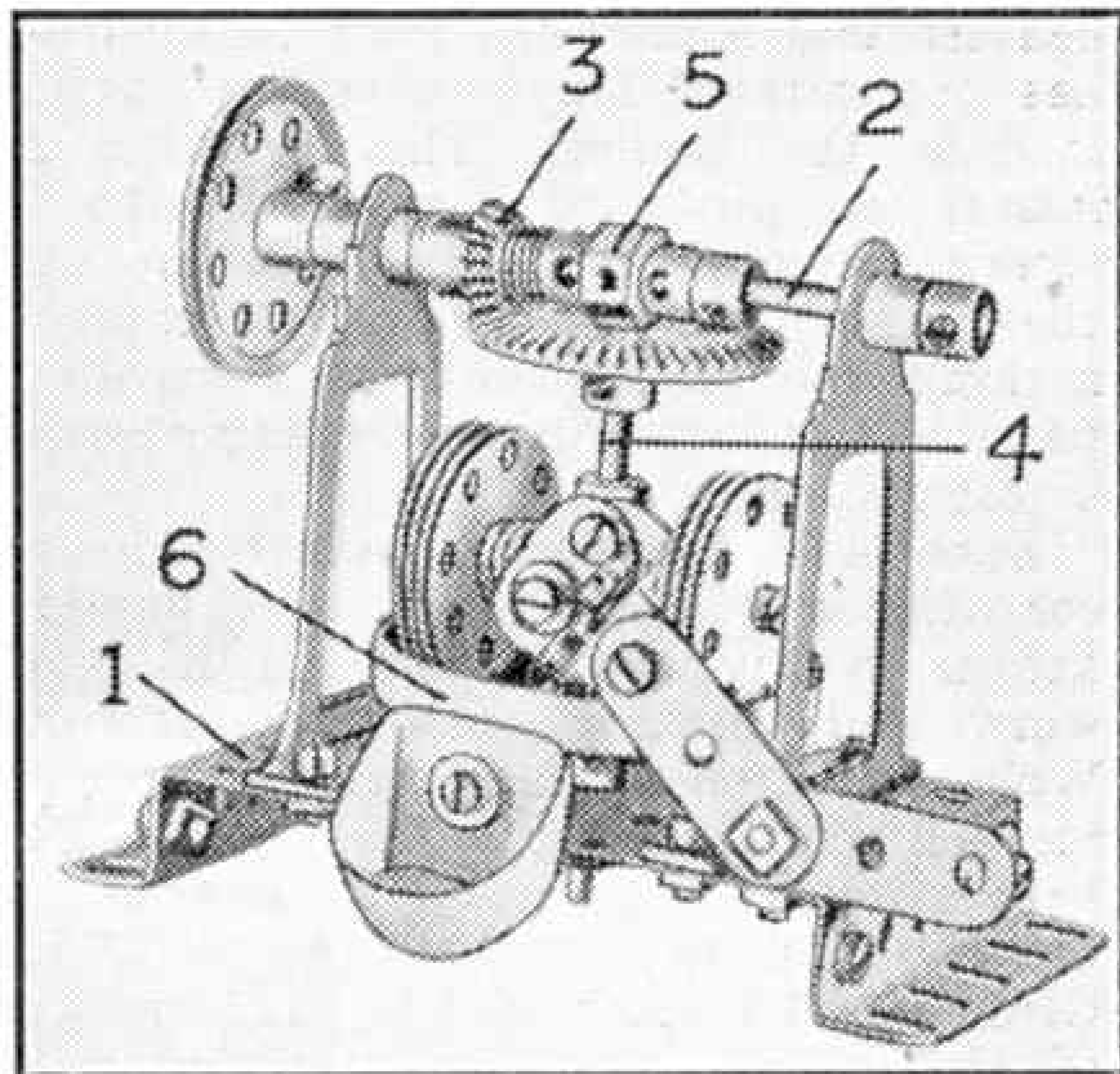
of its prototype, and is fitted with a device that discharges the material after grinding.

The base of the model is the first part to construct. This consists mainly of a $3\frac{1}{2}$ " x $2\frac{1}{2}$ " Flanged Plate 1, to the flanges of which two $2\frac{1}{2}$ " Angle Girders are bolted. Two Small Shafting Standards are attached to the Plate to provide bearings for the driving shaft 2, which is 4" long and carries a $1\frac{1}{2}$ " Pulley, by means of which the model can be driven from a Motor. A $\frac{1}{2}$ " Bevel 3 is also mounted on the Rod and meshes with a $1\frac{1}{2}$ " Bevel fixed on the upper end of a vertical 3" Rod 4. Bearings for this Rod are provided by the Flanged Plate 1 and a Bush Wheel bolted to it, and by an Octagonal Coupling 5 mounted freely on the Rod 2 and held in place by Pinion 3 and a Collar. Washers are used for spacing purposes.

The Rod 4 carries a Wheel Flange 6 that forms the pan in which the materials to be ground are placed. This Wheel Flange is attached to a Bush Wheel fixed to the Rod. A Coupling held between two Collars is mounted freely on Rod 4, and several $1\frac{1}{2}$ " Discs, representing the grinding wheels, are placed on the shanks of two $\frac{3}{4}$ " Bolts gripped in the longitudinal bore of this Coupling, but spaced from it by four Washers.

The discharging device consists of a shovel that is lowered slantwise into the pan while it is rotating, so that the material is directed outward over the edge of the pan. The shovel is formed from an Obtuse Angle Bracket attached by means of a second Obtuse Angle Bracket to a Flat Bracket. The Flat Bracket is lock-nutted by its elongated hole on a $\frac{1}{2}$ " Bolt fixed in the centre tapped bore of the Coupling of Rod 4. The shovel is now attached by an Obtuse Angle Bracket to the operating lever, which consists of two $1\frac{1}{2}$ " Strips lock-nutted to a $\frac{1}{2}$ " x $\frac{1}{2}$ " Angle Bracket bolted to the base.

Parts required to build crushing mill: 2 of No. 6a; 2 of No. 9d; 2 of No. 10; 2 of No. 12; 3 of No. 12c; 1 of No. 15b; 1 of No. 16b; 1 of No. 21; 2 of No. 24; 1 of No. 30a; 1 of No. 30c; 22 of No. 37a; 20 of No. 37b; 28 of No. 38; 1 of No. 53; 4 of No. 59; 1 of No. 63; 1 of No. 63a; 2 of No. 111; 1 of No. 111a; 1 of No. 131; 1 of No. 137; 2 of No. 178; 14 of No. 217a.



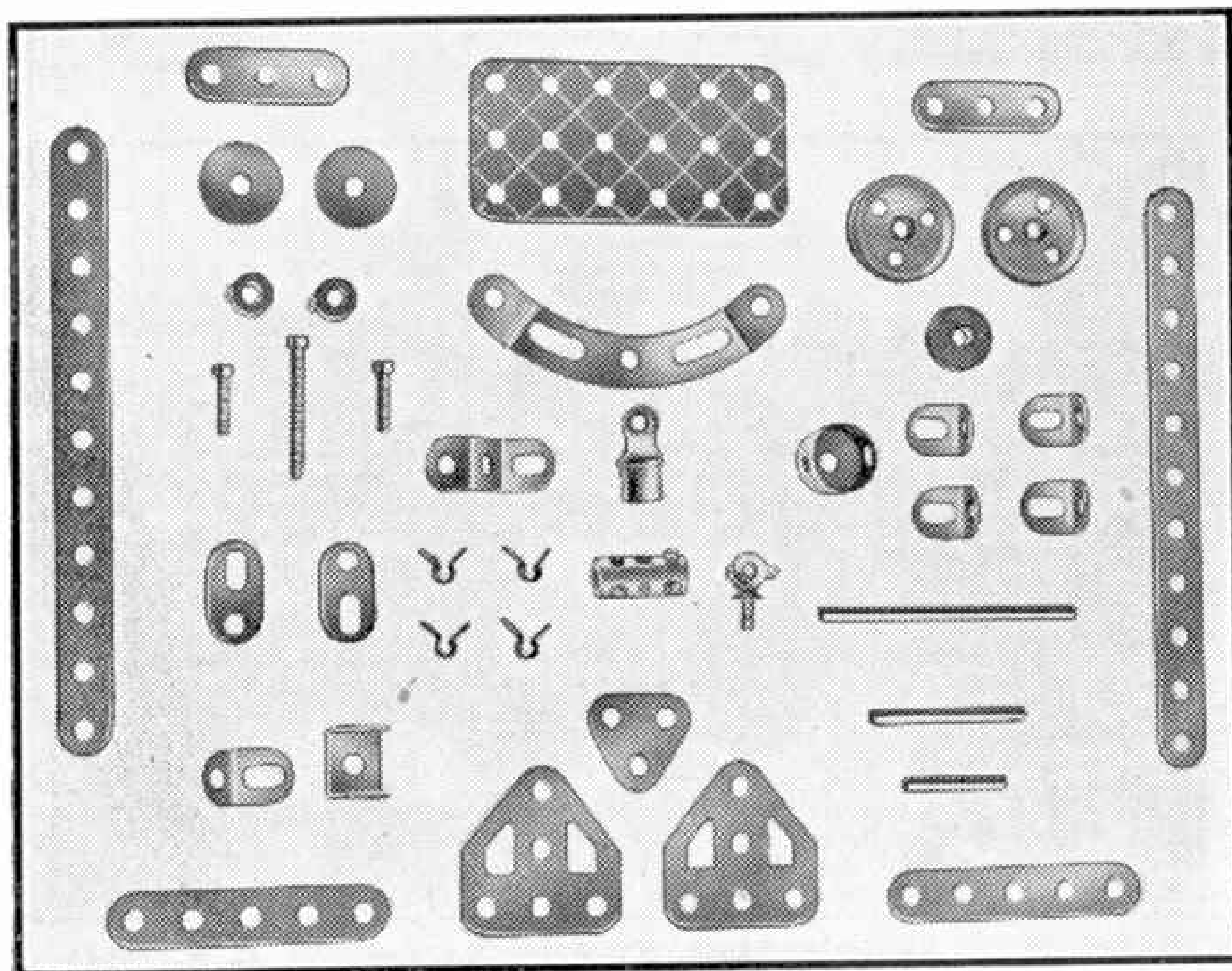
This simple crushing and grinding machine is fitted with an efficient discharging device.

Meccano Model-Building Competition

By "Spanner"

An Attractive Special Parts Contest

This month we have a model-building competition of an unusual and very interesting type. The illustration on this page shows a group of 41 Meccano parts, and prizes are offered to readers who construct the best models in which *these parts only* are used.



Competitions of this kind have always been very popular in programmes of Meccano Clubs, and we are sure that readers generally will enjoy another.

It is not necessary to use every one of the parts illustrated, but no part that is not shown can be introduced into a model entered in the contest. For example, the illustration shows two Flat Trunnions. This means that a model to be entered may have in it either one or two Flat Trunnions, or these may be left out altogether if the plan followed does not allow them to be worked in. Any kind of model is eligible, subject to these restrictions, and the judges will base their decision on the general effect of the entries and on the skill with which the parts are adopted to their various purposes. Where in other respects two models are equal in merit, the one that comes nearest to the inclusion of the whole of the parts shown will be preferred. Bolts and Nuts can be used in any quantity.

There will be two sections in this contest, for Home and Overseas readers respectively, and in each prizes of £2/2/-, £1/1/- and 10/6 will be awarded, with five consolation prizes of 5/- each. The ages of competitors will be taken into account by the judges.

Competitors should send in either photographs or good drawings of their models, together with brief descriptions of any interesting features that may be present. Envelopes should be addressed "Special Parts Contest, Meccano Ltd., Binns Road, Liverpool 13." Closing dates: Home Section, 31st July; Overseas Section, 31st October.

Prize-Winners in the "New Year" Contest

The results of the "New Year" Model-building Competition announced in the January and February 1942 issues of the "M.M." are as follows:—

SECTION A. 1st Prize, Cheque for £2/2/-: R. Hearn, Annesley; 2nd, Cheque for £1/1/-: M. Reed, Woodford Green, 3rd, Postal Order for 10/6: P. R. Wickham, Leicester.

Postal Orders for 5/-: W. Hogbin, Kamsgate; D. Anderson, Gerrards Cross; N. Howarth, Keighley; J. Hammond, Croydon; G. Hollis, Altofts.

SECTION B. 1st Prize, Cheque for £2/2/-: D. Eccles, Southport; 2nd, Cheque for £1/1/-: V. Croose, Gloucester; 3rd, P.O., for 10/6d.: T. Fogden, E. Grinstead.

Postal Orders for 5/-: T. Laming, Surbiton; J. Kentfield, Bridgend; P. Philpot, London, S.E. 9.; W. Ashby, Astley; B. Wright, Irthlingborough.

The first prize-winning model in Section A was a sturdy block-setting crane, and a realistic model ship won the premier award in Section B. We hope to illustrate and describe these fine models next month.

There were many excellent features of other prize-winning models,

and indeed the entire entry was marked by variety in subject and soundness in construction. In Section A third prize was won by P. R. Wickham's saddle-tank locomotive "Welsh Pony." The model is 2 ft. long and 10 in. high and is mounted on a chassis built up from Angle Girders and Strips. A Clockwork Motor provides power, the drive being led through reduction gearing to the rear pair of driving wheels. The tank and boiler consist of Flexible Plates bolted to Strips and Curved Strips, and the smoke-box front is a 3" Pulley to which a Wheel Disc is attached.

Second and third prize-winners in Section B, V. Croose, Gloucester, and T. Fogden, East Grinstead, submitted fine models of H.M.S. "Rodney" and an army lorry respectively. V. Croose's model has an overall length of 4 ft. 1 in. and a beam of 5½". The hull is constructed from Strips and Flexible Plates, which are attached rigidly to Flanged Plates forming the deck, and the 16" guns are mounted in turrets built up from 3" Formed Slotted Strips pivotally secured to the deck and fitted with Road Wheels. The superstructure is neatly constructed from Flexible Plates, and is fitted with an aerial and a rangefinder.

T. Fogden's lorry is driven by a No. 1a Clockwork Motor and includes a four-speed and reverse gear box, clutch and a differential gear. The foot and hand brakes of the model are interesting. They not only operate the brake shoes, but also a switch controlling a red rear lamp.

An ingenious model lift incorporating push-button control won second prize for M. A. Reed, Woodford Green.



Club and Branch News



WITH THE SECRETARY

WHAT TO DO DURING SUMMER

There should be no difficulty whatever in finding plenty to do during the outdoor season, in spite of wartime restrictions. Rambles afoot or awheel should be arranged weekly, preferably on Saturdays, when more time is available than on other days, and they should always be planned with a definite objective, such as a well-known place of interest, or some open space, such as a stretch of sand or a moor, where a few games can be played. Excursions farther afield should not be contemplated, for we are asked specially not to travel by rail except when absolutely necessary, but I am convinced that sufficient interest can be cultivated in things and places near home to make up a good outdoor programme.

The suggestions that I made last month in regard to cricket and swimming should be borne in mind, but it should not be overlooked that club work can be kept going throughout the summer, particularly if we have a wet spell or two. For instance, a series of simple contests of various kinds might be arranged, the dates being left open so that any one contest can be fixed for a wet day that otherwise would have been spent out of doors. Another way of meeting weather difficulties is to arrange cinema visits when films that are likely to be of special interest and value are on view. Then there is the problem of tidying up or re-organising Club material, a task to which I know members turn willingly and eagerly when they are prevented from carrying out their original intentions.

Schemes of this kind should be kept in mind to prevent disappointment when bad weather compels the abandonment of some outdoor diversion already planned. When members are taken back to the Club room, the meetings need not always take any of the forms I have noted. Other good ideas are to arrange a Debate or a "Quiz" Contest, or to call for impromptu three-minute talks on subjects drawn at random from a hat, each member thus being given a topic on which to dilate to the best of his ability. Small prizes can be awarded in events of this kind, and even if they do not result in the discovery of budding orators they are sure to give rise to real fun and excitement.

Proposed Clubs

WITHERNSEA—K. Purkins, "Banavie," Holly Road.
CAMBRIDGE—J. C. B. Hughes, Southmead, 43, Hurst Park Avenue.

Proposed Branches

LUDDENDEN—K. Hobson, 5, Benns Lane, Luddenden, Nr. Halifax.
CANFORD—R. Telphs, The "Long Coppice," Canford.

Branches Recently Incorporated

B.424—HEMEL HEMPSTEAD—Mr. E. J. Sherrett, 33, Risedale Road.
B.425—WEST WICKHAM—Mr. G. L. Edmeads, 67, Silver Lane.
B.426—BRENTWOOD—Mr. T. R. Cockell, "Pyrford," Park Road.

Club Notes

HILLSIDE (WHITEFIELD) M.C.—Model-building has been continued and the models built have been



Members of the Rochdale Branch, No. 417: Chairman, Mr. D. R. Morgan; Secretary, A. Morgan. This Branch was incorporated in August of last year. Enjoyable track meetings are held regularly, each member occupying a definite railway position, and electric lighting is being installed for stations, signal boxes and signals. Operations are also carried out on a garden layout, and Lantern Lectures and the organisation of a good railway Library complete a fine programme.

exhibited. One member has given a Lecture on "Tanks." The Aircraft Recognition Section continues to be popular, and there has been keen competition in proficiency contests. Various open-air activities are now being pursued. Club roll: 15. Secretary: D. I. Johnson, 27, Hillside Avenue, Whitefield, Nr. Manchester.

HORNSEA M.C.—The sections have been busy with constructional work, the "Junior Engineers" making a railway sign, the "Apprentices" practising screwing and nailing pieces of wood firmly together, and others making a boat and a Morse tapper. The scientific courses have been continued, and Lectures have been given on "Bacteria," "The Manufacture and Distribution of Electricity" and "The United States and Canada." Club roll: 33. Secretary: C. Kemp, 5, Carlton Terrace, Cliff Road, Hornsea.

Branch News

ACTON.—At the Sixth Annual Meeting officials were elected for the year, Merit Medallions were presented to the winners, and final plans for the new Branch Headquarters were approved. Film Displays also have been given. Secretary: S. W. Simmons, 37, Derwentwater Road, Acton, London W.3.



A realistic station scene showing the effective use of various lineside features. Note the appearance of "distance" given by the scenic background.

On the Lineside of your Hornby Railway

THE interest of the miniature railway hobby extends far beyond the movement of locomotives and trains, although this naturally is the principal feature in the development of realistic operations. Train working however is given an added attraction if the correct signals are provided for the layout and for the movements to be carried out; equally important too in giving an atmosphere of realism to the proceedings is the arrangement of the various lineside features.

The average onlooker or visitor to a miniature railway system who is not an enthusiast himself when looking at certain layouts, sometimes has difficulty in telling just where the railway ends and the surroundings begin. Admittedly at times space restrictions make a certain amount of crowding inevitable, but it is usually possible to place some boundary to mark off the railway premises in the neighbourhood of stations and their goods yards and along the ordinary main line stretches. In this country the railways are bound to fence in their property so that in miniature it is necessary to give some attention to this point. For this purpose the Hornby Paled Fencing is ideal. It can be bent to follow the course of the track at curves and thus it gives a neat finish to the lineside. This same material forms the standard fencing on the platform of the larger Hornby Stations so that a tidy and consistent effect is obtained by its use at the lineside generally.

As an addition to the Fencing or as an alternative to it at certain spots good use can be made of the lengths of Hornby Hedging. These give a welcome touch of green along the lineside and where the "countryside" is at all extensive they can be employed to divide off one field from another and so on. Associated with them are the Hornby Trees, both "poplar" and "oak" patterns. These can be dotted about the lineside generally while single trees or little groups of them give quite a good appearance

to "fields," embankments and cuttings.

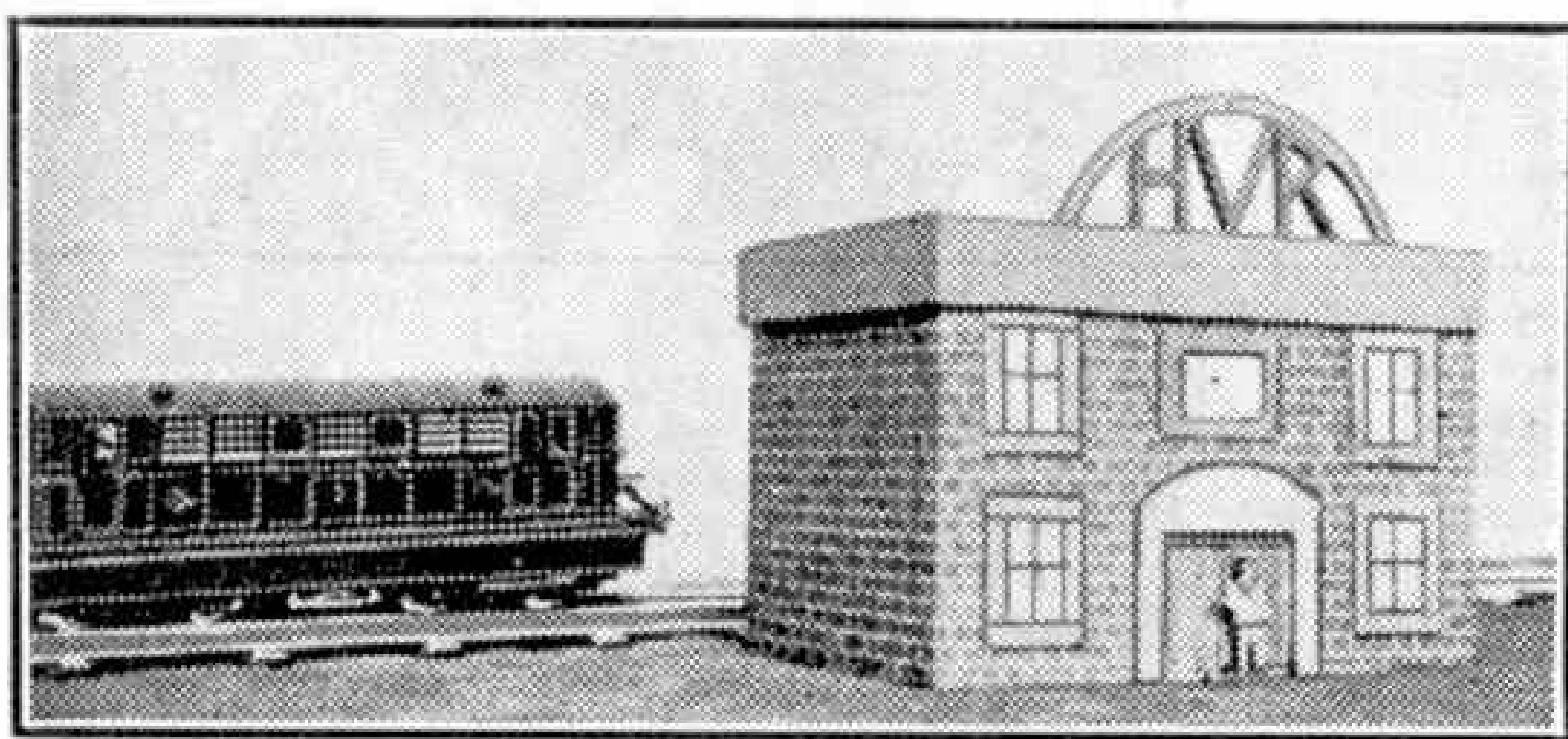
A specially useful Accessory is the Station Hoarding. This is principally intended for use on Station platforms for the display of the attractive Miniature Posters. It can be employed in addition as an effective timetable board and for this purpose a strip cut from an actual timetable can be stuck on. The Hoarding can be placed outside the Station in the road approach for either of the two purposes just mentioned, and it looks well along the actual lineside; in the latter situation it should not be placed too close to the railway or "passengers" will be unable to see properly the posters displayed on the board.

The Platelayer's Hut and the familiar Watchman's Hut are two little structures that add considerably to the railway-like atmosphere of the lineside. The Watchman's Hut is of course a "winter" building for that is the season when it is most frequently necessary to have fogmen posted along the track. The Watchman's Hut therefore can be staffed by one

of the Miniature Figures at times when a fog is supposed to be about. The Platelayer's Hut on the other hand can practically always have some of the "permanent way staff" in its neighbourhood.

Electrically operated railways offer interesting opportunities for the ingenious miniature railway engineer to provide special buildings for different purposes that can

easily be made at home from thin wood or even cardboard. An effective model of this kind is shown in the lower illustration on this page. This represents a transformer "house" or sub-station and is the work of our reader Mr. A. R. Wilson of Halifax, for his "Hebble Valley Railway," an imaginary line "somewhere in Yorkshire." This model has a dummy "doorway" to allow parts of the electrical installation to be moved into the building. When all is complete this entrance is bricked up. A movable trap-door allows the controller handle to be operated.



The front of a home-made transformer sub-station on the "Hebble Valley Railway" of Mr. A. R. Wilson, Halifax. The building houses a Meccano Transformer.

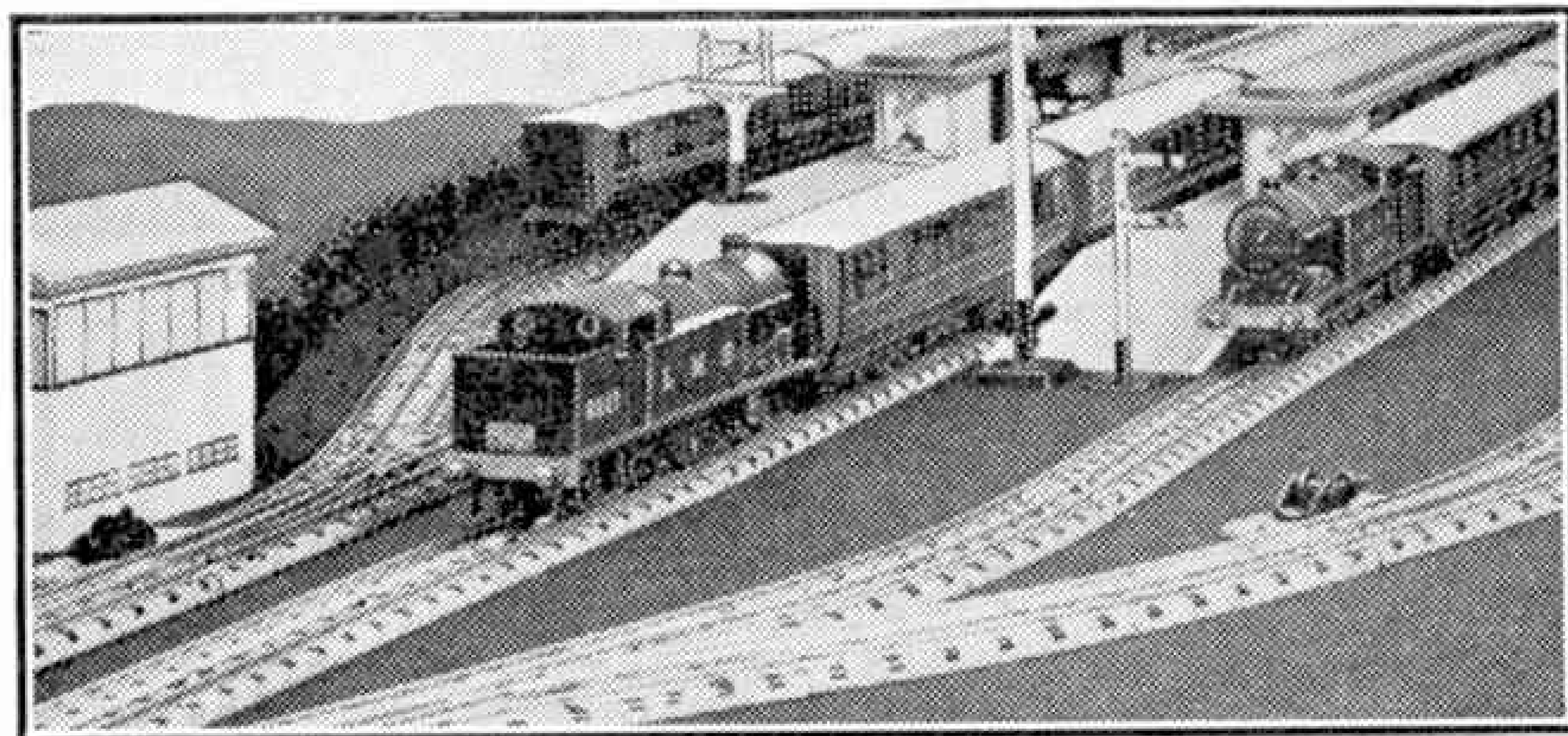
Hornby-Dublo Suburban Train Working

ONE of the advantages of the smart and imposing Hornby-Dublo Standard Tank Locomotive is that its "mixed traffic" character allows it to be used equally well on passenger as on goods services. It is typical of the useful 0-6-2 tank of actual practice with medium-sized driving wheels, that does a great

and so be worked back to its original starting point.

This simple routine can be varied by imagining a "rush hour" period, when the train may require to be strengthened by the addition of another vehicle. The Corridor Coach D1 can be added to the Twin Unit for several journeys and then detached when traffic slackens off again. At other times a van or two can be conveyed by the train for some particular local traffic—a Horsebox perhaps, or one of the various vehicles suitable for the carriage of perishable or urgent goods.

With bigger layouts more involved operations become possible, and as a rule the larger systems have sufficient equipment to allow such working to be carried out. A terminus station, for instance, arranged perhaps with the components of the Hornby-Dublo City Station Outfit, can have a platform and tracks reserved for suburban traffic. If a running-round loop is provided, then a single engine can give very good service. It



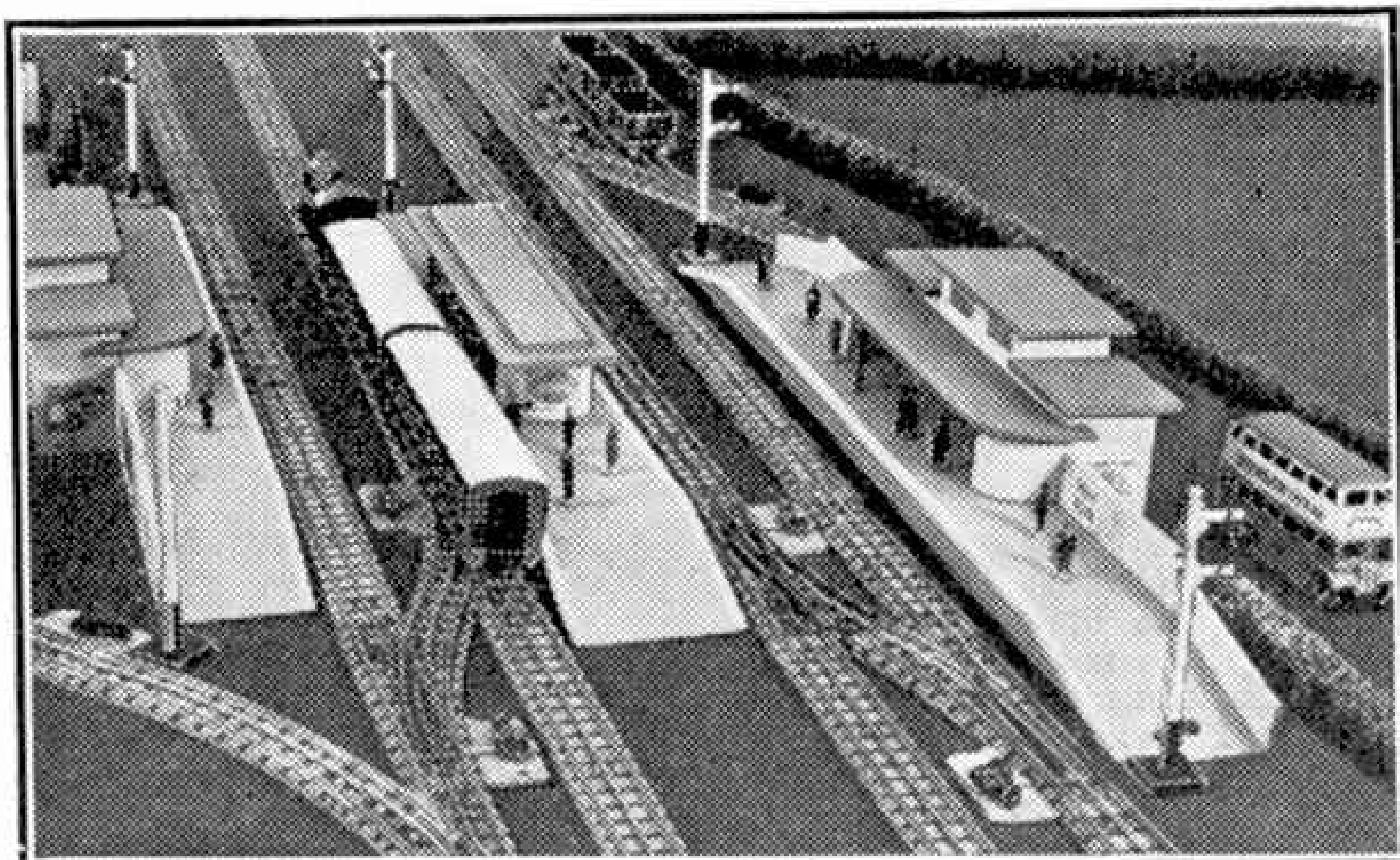
A realistic suburban station formed of two Island Platforms. One train is held in the bay platform while the other gets ahead on the main line.

amount of work in local goods and passenger services. The Hornby-Dublo range does not as yet include suburban passenger coaches, but it is possible to conduct local passenger traffic by means of the standard Two-Coach Articulated Unit. Although this represents a main line corridor "twin," real corridor stock appears at times on local work, especially when filling in time between long-distance trips; so that the use of the Dublo Unit in miniature for suburban duties is quite reasonable.

With a single engine and train quite an interesting service can be run, even on the simplest layout. On a continuous track, an "all stations" train can make successive halts at the same station on each circuit in order to represent the conditions of making a journey from point to point. The actual methods of working will depend to some extent on the station layout. Thus if a loop line is provided at the station, forming in effect separate "up" and "down" tracks, the "running round" of the engine ready for the return trip when the end of a "journey" is reached can easily be carried out. During periods of heavy traffic the "turn round time" allowed at terminal points is usually very short, so that smart working is necessary if time is to be kept. On a Dublo system a single operator can amuse himself by seeing just how smartly the running round operation, and in fact the terminal work generally, can be carried out. With two or more members of the "staff" available the various duties can be divided up in a satisfactory manner.

If there is no loop line, "running round" cannot be done in the orthodox manner, but the engine can be got to the other end of the train ready for the return journey by uncoupling it at the end of a journey and running it right round the track until it reaches the train again. The train can then make another trip

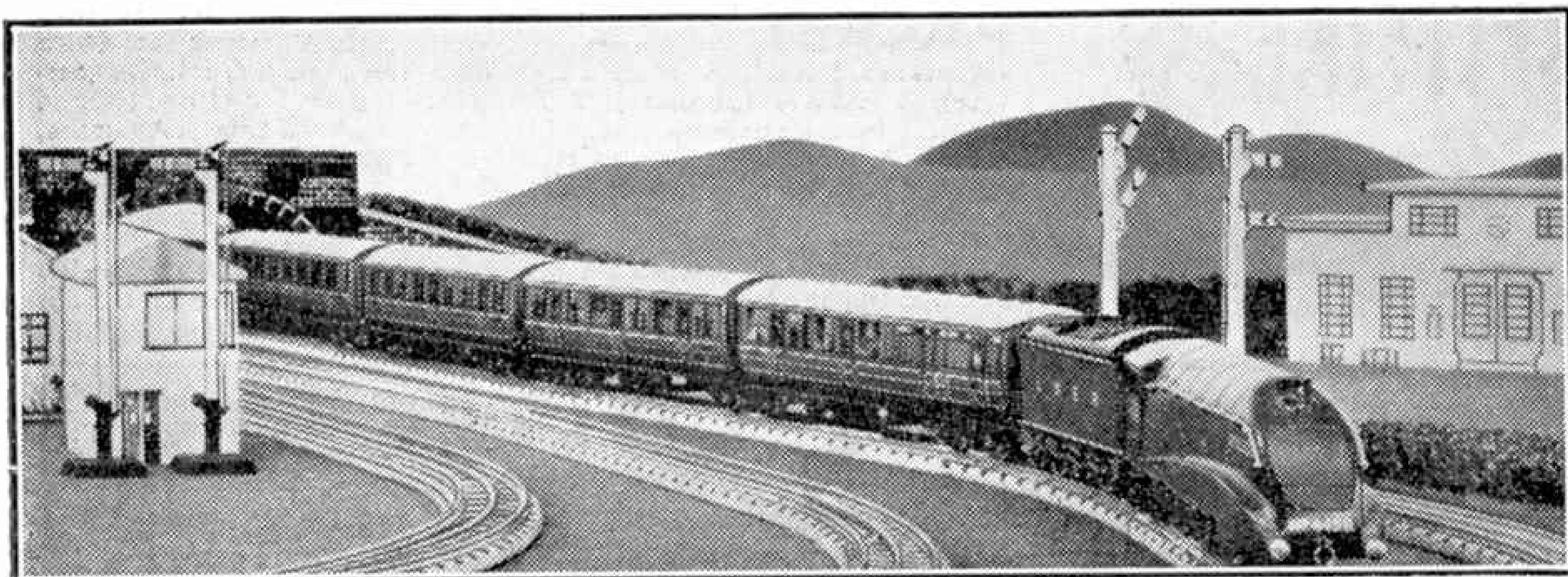
frequently happens however that the length available for a terminus station does not permit of the inclusion of crossover points, and the length of "draw ahead" track near to the Buffer Stops, necessary for running round facilities. Then we have to adopt the "turn-over" system of engine working. This means that one engine brings the train in and is detached; another engine, which has been waiting in an engine siding or perhaps in an Engine Shed or yard outside



Two Main Line Stations and an Island Platform make up this four-track station. Traffic is evidently quiet at the moment as the "local" shown is using the main or "fast" line.

the terminus, comes on to the other end of the train ready for the return journey. Soon the train departs and the first engine is then released to stand by until it in its turn takes out another train that has arrived.

To carry out this scheme it is necessary to arrange for the platform lines in the terminus to be sectionalised by means of the Isolating Rail which we have dealt with previously in these pages. The arriving engine can then be held on an (Continued on page 230)



A Hornby-Dublo express rounding a curve headed by the streamlined 4-6-2 "Sir Nigel Gresley."

Fun in Dublo Train Running

THIS month we show in the diagram on this page another simple layout on which Hornby-Dublo owners with a limited amount of rolling stock can have some good fun in train running and operating generally. The layout is single track and is continuous, so that a certain amount of "make believe" is necessary when the trains are supposed to be making a round trip between what are in real life terminal points many miles apart.

The favourite oval formation is employed for the main line, and alongside the lower straight side of this there is a standard Main Line Station. From the opposite side of the layout there diverges by means of a set of Right-Hand Points a siding that runs diagonally across the inside of the main oval and through an Engine Shed to the Buffer Stop. The length of track between the Shed and the Buffers can be used to accommodate an engine waiting "for repairs."

From the diagonal siding just referred to there is thrown off another track, this time by means of Left-Hand Points, and this line runs parallel to the main line. It can be used for any of several purposes. Passenger stock can be stored there when not in use, or goods wagons can be held there. Alternatively the line can be used by the "Locomotive Department" for coal wagons to stand on.

In our article last month we dealt almost exclusively with goods train operations; now we are going to follow up some passenger train working schemes for which the layout we have just described is particularly suitable. We will suppose that we are the fortunate possessors of the components of the Dublo Passenger Train Set consisting of the 4-6-2 Streamlined Locomotive "Sir Nigel Gresley" and a Two-Coach Articulated Unit. We can use in addition a standard Corridor Coach to make up a three-coach train, but this makes no actual difference to the operations.

With a single passenger express locomotive available the first move will be to run the engine out from the Shed and into the siding near by, if the latter is used for stabling the train. Possibly the vehicles will be kept at the station when not in use, and if so

the engine will have its coal and water supplies attended to in the siding, and then make its way out on to the main line. Having done so it backs in a clockwise direction round the main track to the station. This represents a terminus for the time being, and the familiar "backing in" operation, either of the engine or of the complete train, is thus reproduced.

After a brief wait for the passengers to entrain, the starting signal of the Single Arm "home" pattern shows line clear and the train moves out of the station, this time of course in a counter-clockwise direction. We will suppose that the train is to make several circuits of the track non-stop, and that being so the Double Arm Signal that is encountered as the train nears the station again will have both its semaphores "off" except when the train is about to make a stop. Then the lower or distant semaphore will be in the horizontal position, indicating "caution."

We are working, say, a north-west express from "King's Cross," and the first stop after several circuits can represent York. To add some variety to the operations we can make this an engine changing point. If there are two operators this engine changing

arrangement gives each a turn at managing the train while the other operates Points and Signals, which is desirable if each boy has his own engine on the line. Even with one engine the appearance of engine changing can be maintained. The engine is uncoupled from the train and then run forward round the line until just past the points leading to the locomotive yard. The points are changed, and the engine can be backed into the

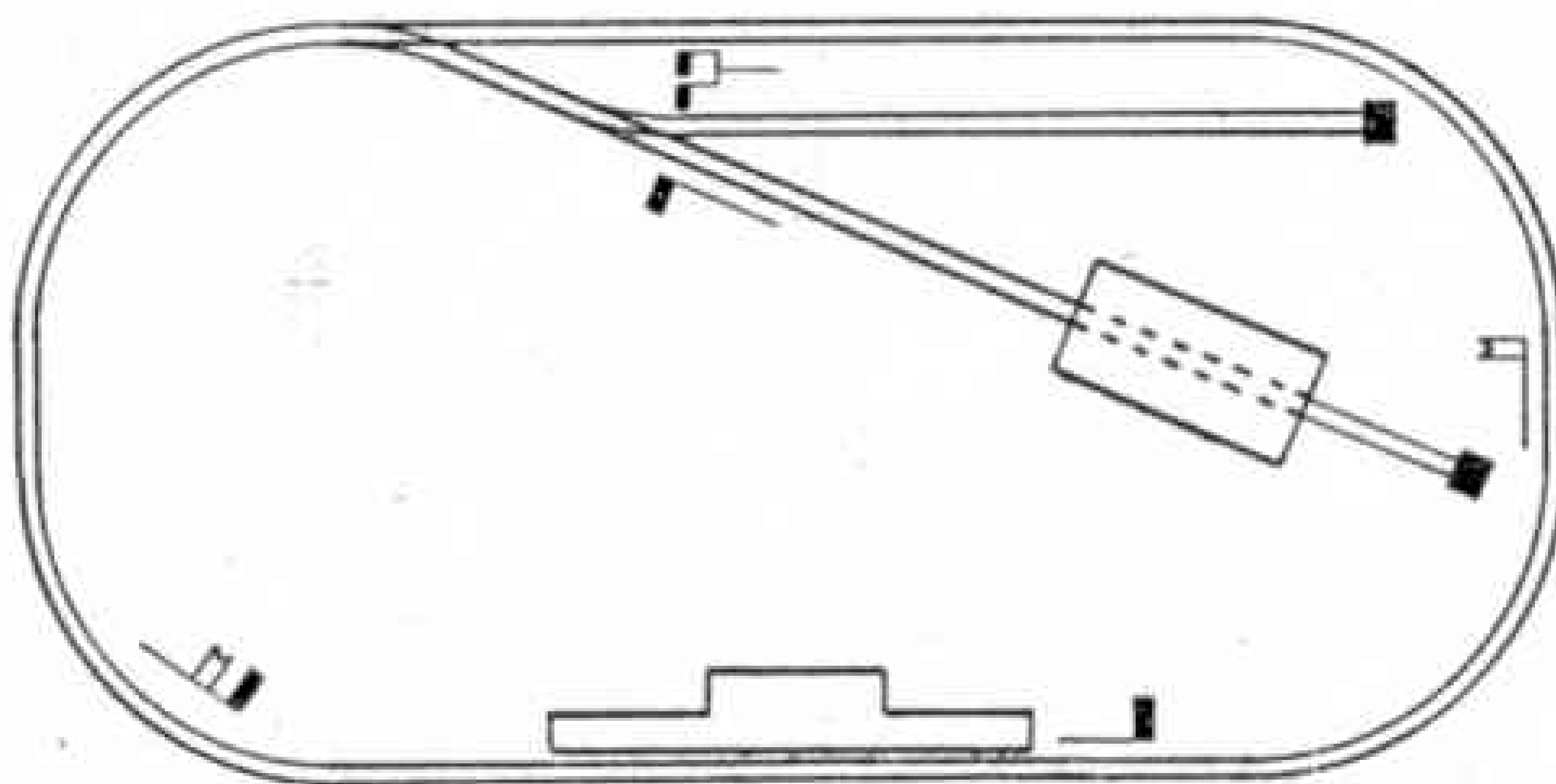
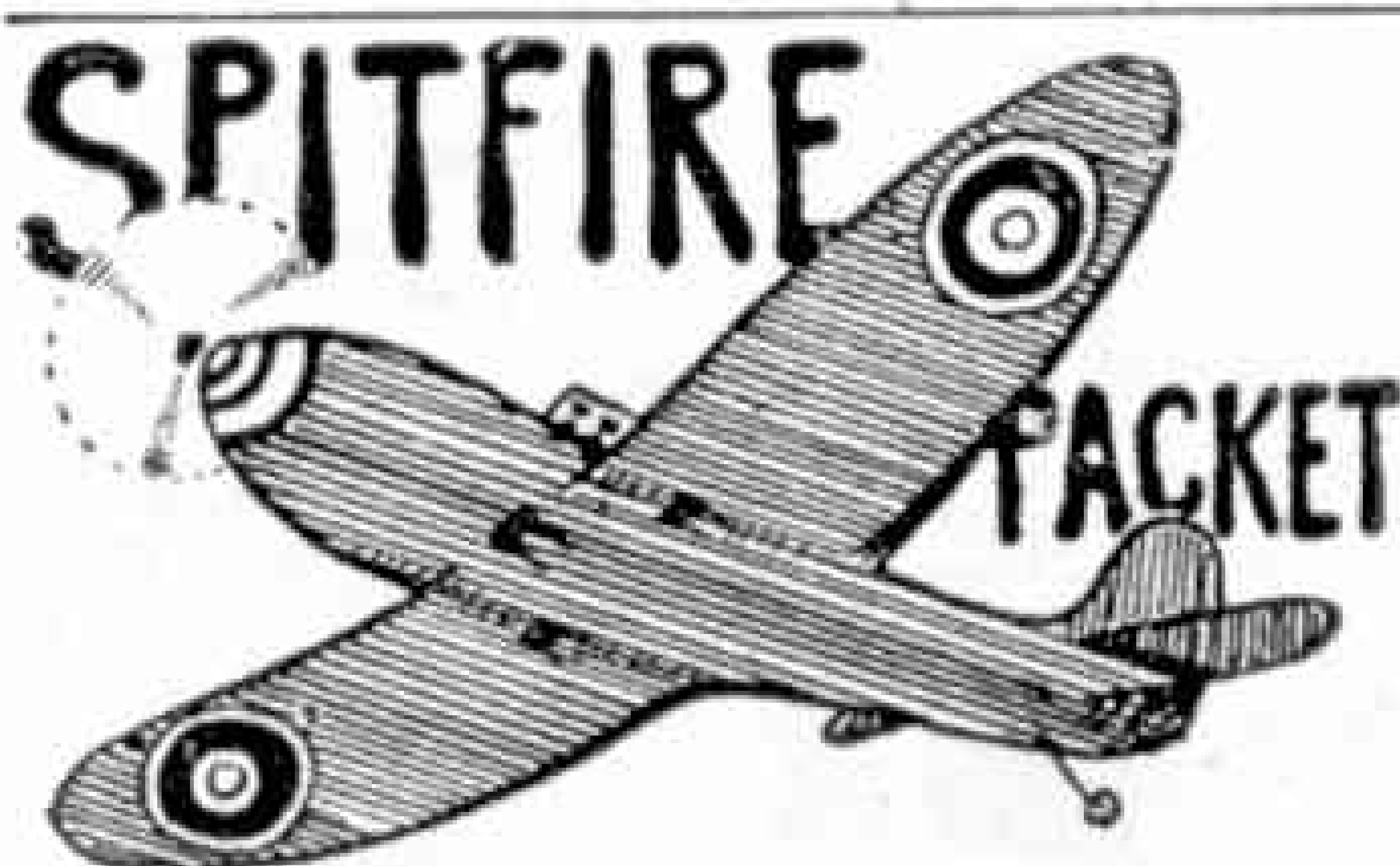


Diagram of the layout referred to on this page.

Shed momentarily. It then emerges again as if it were a fresh engine going out to its work.

The next stop can represent Newcastle; then on to Edinburgh, where another engine "change" can be carried out; and as streamliners work north beyond that city the use of our miniature No. 4498 on to "Dundee" and so to "Aberdeen" will be in order.

With two engines available sectionalising of the engine sidings on the lines dealt with in these articles will be necessary, and the provision of an additional track in the Engine Shed will be an advantage.



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Stamp Collecting

Places in the News

By T. J. Edwards

EVERY stamp collector's thoughts must centre largely around the course of the war, even when he is engrossed with his stamps. Stamps can be made to help in gaining an understanding of the huge scale of this war, and this article is intended to show how they can be used in making a pictorial map of places in the news.

Our map must start in Britain, but there are few British views of any real help to us. London can be represented by two stamps at most. One of these is Australia's issue of 1935, commemorating the 20th anniversary of the landing of the Anzac Division on Gallipoli. It shows the Cenotaph in Whitehall. The Houses of Parliament at Westminster, damaged in an air raid just over a year ago, formed part of the French design commemorating the visit of our King and Queen to Paris in 1938. Another home design that should be included is the view of Windsor Castle on the general Colonial issue for the Jubilee of King George V in 1935.



The capitals and administrative centres of the United Nations and the "Axis Powers" can all be represented by actual views in their great cities. Thus the White House, centre of the huge American effort, is shown on the 4½c. value of the United States Presidential series of 1938, and the Capitol at Washington, the equivalent of our Parliament Buildings, is featured on the \$2 value of the 1922 issue.

Recent issues of the Soviet Union provide many views of Moscow and Leningrad, the best being the New Moscow series of 1939, depicting scenes in the streets of Moscow. Landscapes in the Crimea, one of the principal centres of recent fighting, are shown on special Crimea issue of 1938.

For China we must content ourselves with views of Shanghai and one of the Ministry of Communications at Nanking, all of which were features of the Postal Service Commemorative issue of 1936. Australia provides a view of the Federal Parliament Buildings at Canberra on the 1½d. stamp issued to celebrate the opening of Parliament in 1927. Sydney Harbour and Bridge were the subject of another commemorative series in 1932.

Turning now to Canada, the Parliament Buildings at Ottawa are shown on the Universal Postal Union Congress commemorative issued by Canada in 1935.



For South Africa we have the Union Buildings, the Dominion's Parliament, as subject of the design of the current 2d. value.

India, so urgently in



the news to-day, showed an excellent series of views of New Delhi, her capital city, on the special issue commemorating the inauguration of the capital in 1931. These views show the Viceroy's House, the Council House, and the magnificent Secretariat Buildings. Many of our older readers will remember the interesting special article dealing with this issue that appeared in the "M.M." shortly after the appearance of the stamps.

Newfoundland has included many views of St. John's in her many pictorial issues of recent years.

Berlin, Rome and Tokio, the Axis capitals, have been pictured on several occasions. Berlin views appear on the German 1930 Charity series among others; there is a general view of Rome on the 5L value of Italy's 1936 and 1924 Holy Year issues; and the Imperial Diet buildings in Tokio are the features of the 1½ and 10 sen values of Japan's 1936 issue.

Other centres of interest can be brought into the story as they become topical. Thus the recent R.A.F. bombing attacks on Germany are illustrated by views of Lübeck in the 1931 Charity series and of Cologne in the 1924 "scenic" set.

In this connection thoughts turn naturally to the outposts of the Empire that have so lately been swallowed up by the Japanese onrush, and to those that are bearing the brunt



of the current fighting, especially Malta. The Grand Harbour at Valletta, one of the main objectives of Nazi bombing, has been pictured in several issues of the island, including the ½d. and 1½d. value of the current series. Gibraltar and Cyprus, our other Mediterranean strongholds, and Aden, the famous Red Sea station, are also well illustrated in their stamps, examples of which are given on page 229.

Burma has a fine view of the River Irrawaddy, scene of bitter fighting, on the 8a. view of the current series; while Port Moresby, objective of many Japanese bombing attacks in an effort to establish a base for an attack on Australia, is shown on the 1d. value of Papua's Jubilee issue of 1935. For Ceylon, the scene of a great air victory over Japanese raiders, there are views of Colombo Harbour, and other interesting places in the islands in the 1935-36 and 1938 issues; while stamps of the Fiji Island Coronation issues of 1937 show scenes of various kinds in the islands.

Other stamps can be built into the story, and readers who decide on the making of such a collection will find it an absorbing summertime occupation.

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Stamp Gossip and Notes on New Issues

South Africa's War Effort Series

Now that the complete series of South African "War Effort" stamps has been produced, we take the opportunity to summarise the details of the issues and



to illustrate one of them. There are eight stamps in the series, all of which, except the 2d. and 1/- values, are produced in the customary bi-lingual make up, with English and Afrikaans wording alternating stamp by

stamp throughout the sheets. The 2d. and 1/- values bear bi-lingual wording on each stamp.

The designs and dates of issue are as follows: ½d., Infantry; this stamp was first released on 19th November 1941; 1d., Nursing Service, 3rd October 1941; 1½d., Air Force, Portrait of Flight-Lieutenant Kershaw, 12th January 1942; 2d., Sea Defence, 15th September 1941; 3d., Women's Auxiliary, 1st August 1941; 4d., Artillery, 20th August 1941; 6d., War Production, 3rd September 1941; and 1/-, Mechanised Units, 27th October 1941. The stamp we illustrate is the 1½d. value, to which we made special reference last month.

It is understood that Canada is contemplating producing an issue on similar lines, but at the time of going to press no definite statement has been made by the Canadian Post Office.

More Free French Overprints

Immediately on taking over the administration of the French North Atlantic colony, St. Pierre et Miquelon, the new authorities seized all existing stocks of stamps and applied an overprint reading: "Noel 1941—France Libre—F.N.F.L." The first 500 sets were overprinted in black, except for the 1 fr. 75 value, of which only 300 were so treated. Then further sets were overprinted in red, with the quantities

varying from 1,800 of the 20c. down to 1,315 of the 1 fr. 75.

It is believed that a special "Christmas charity" overprint was applied to certain Postage Due issues, but no clear facts have emerged concerning these. Later, another 19 new stamps were manufactured by introducing another form of surcharge



reading "France Libre." Altogether there are now 63 different values in the various forms of overprinting!

A New Soviet Union Stamp

A stamp to look for is the Soviet Union's special issue of September last to mark the opening phase of the struggle against Nazi Germany. Specimens are not available for illustration in Britain yet, but it is known that copies are now finding their way to New York.

The design shows a three-quarter length figure of a Soviet soldier in full equipment, with his mother bidding him farewell as he leaves for the front. Set boldly across the foot of the stamp is the exhortation "Be a Hero!" The stamp is in the large vertical setting so favoured by the Soviet Union for its pictorial issues and it is produced by the photo-gravure process.

United States Victory Slogans

Collectors of meter marks should be on the alert for specimens of the new "victory" slogans that are appearing on current metered mail from the United States. The Pitney-Bowes meter machines have introduced a most attractive series of pictorial slogans

that have changed their theme from the earlier "defence" idea to the more positive one of "attack."

Typical slogans show pictures of "Uncle Sam," a United States soldier, aeroplanes, war factories, and the Stars and Stripes, with wording such as "Remember Pearl Harbour," "Defend America's Freedom," "It's Everybody's Job," "Keep 'em Flying," "60,000 in '42—We can do it—We will do it." The last of their slogans is accompanied by a picture of a "Hudson" bomber.

Dutch Colonial Native Dancers

A Dutch East Indian issue that is certain to prove hard to get, because its final values had appeared only just before the Japanese invasion, is a series of five stamps illustrating typical native costume dancers.

The designs are as follows: 2½c., religious male dancer from Nias, an island off the west coast of Sumatra; 3c., Bali girl dancer; 4c., male Javanese dancer, in the traditional costume of the native Prince Ardjuno, from the native play Wajang-Wong; 5c., girl dancer from Batuk, Sumatra; and 7½c., male dancer from Dajak, Borneo.

These dancers are highly trained performers of traditional forms and movements that have been handed down unchanged through many centuries.

We thank David Field Ltd., 7, Vigo St., London W.1, for their courtesy in loaning the stamps from which the illustrations for these pages have been made.



Leaders in the War

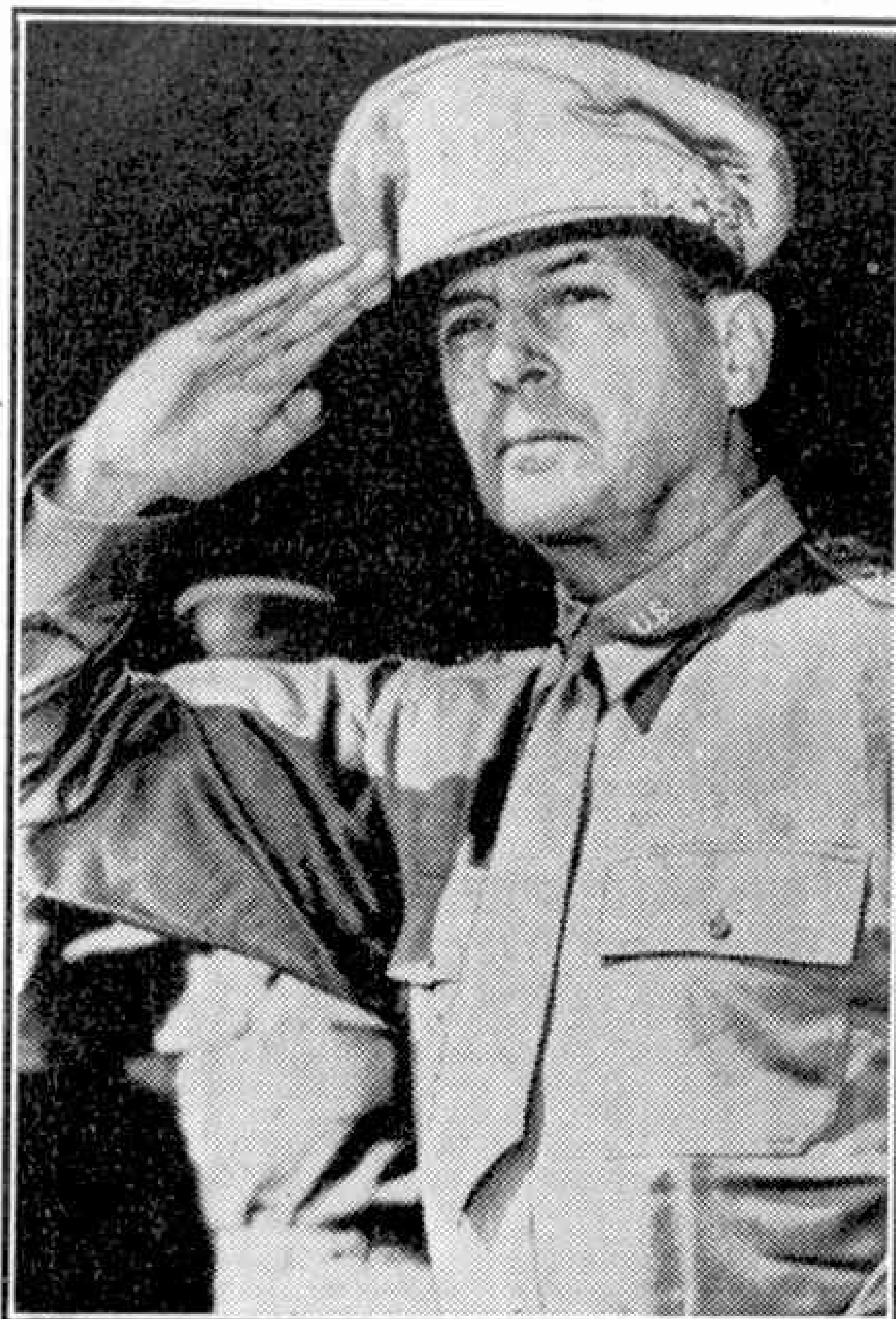
General MacArthur

General Douglas MacArthur has literally been in the Army all his life, for he was born at a small military post at Arkansas, U.S.A. in 1880. He comes of fighting stock, his father, Maj. Gen. MacArthur, having had a distinguished military career.

Gen. MacArthur was head of his class when he graduated in 1903 for the U.S. Military Academy, and his subsequent military activities were intense. By 1910 he had served in the Philippines and in Japan, had been A.D.C. to the President for a year, and for two years an instructor in the U.S. Mounted Service Schools. He was a member of the General Staff in 1913-15, and again in 1916-17. When the United States entered the World War in the latter year he was appointed Chief of Staff of the 42nd (Rainbow) Division, formed of National Guard units drawn from all parts of the country, and in 1918 he became Commander of the Division, with which he took part in many actions in France.

He served with the Army of Occupation in Germany from November 1918 to April 1919, when he returned home to become Superintendent of the U.S. Military Academy. From 1922 to 1925 he was again in the Philippines. In 1930 he became Chief of Staff, and five years later was placed on the retired list at his own request.

General MacArthur then returned to the Philippines, this time as military adviser to the Commonwealth Government, and organised and trained the Philippine Army. His success in this work has been shown by the magnificent struggle of this army against the Japanese invaders. It was only on the direct order of President Roosevelt, and at the request of the Australian Government, that he finally transferred his headquarters from the Philippines to Australia; and he is now in supreme Command of the Allied forces there.



General Douglas MacArthur, Commander-in-Chief, Allied forces, South-West Pacific Area.

Famous Inventors: Thomas Alva Edison—

(Continued from page 209)

time and after a few repetitions was useless. Edison then tried pure wax, which gave better results, but the cylinders were too fragile. Finally he used a composition of waxy materials on which the sound vibrations were engraved with a tiny sapphire. Reproduction was by means of another sapphire with a ball-shaped tip that did not cut the record. Hand rotation of the cylinder was superseded by the use of a clockwork motor.

The news of this invention was received by the public with intense interest and the wildest accounts of the nature and capabilities of the instrument were published in the newspapers. Some people refused to believe that the invention was genuine and declared that the whole thing was a hoax. Among them was a certain bishop, who appears to have thought that a ventriloquist was hidden somewhere near by. To put the matter to the test he recited into the recorder, as fast as he could go, a long sequence of difficult names from the Bible. To his astonishment these names were repeated correctly by the instrument. The bishop was then convinced, because he said, no other man living could have spoken the names at such a speed!

Edison's records were made by what is known as the "hill-and-dale" method, in which the engraving tool rises and falls. Another method, known as the "lateral cut," in which the tool is moved from side to side, was developed by Emil Berliner, one of the pioneers in the development of the telephone. For this second method a disc proved more suitable than a cylinder, and the disc type of talking machine, or gramophone, was developed to a high state of perfection and became very popular. Edison then turned his attention to the production of a disc record and finally developed a disc phonograph that proved extremely successful. He still adhered to his hill-and-dale method of recording. Since that time, however, lateral cut records have almost entirely superseded the hill-and-dale type.

(To be continued)

Hornby-Dublo Suburban Train Working—

(Continued from page 224)

electrically isolated section near to the Buffer Stops, while the "turnover" locomotive is in possession of the main platform section. Similarly the engine waiting in the siding will have to stand on an isolated section to avoid interfering with the movement of other engines in and out of the station.

This War and 1914-18—

(Continued from page 199)

between friend and foe until it was too late.

There have been countless other innovations in this war, but one factor remains unchanged. It is best summed up in a sentence which appeared in a British General's despatch many years ago, but remain true to-day and ever will be: "The men are splendid."

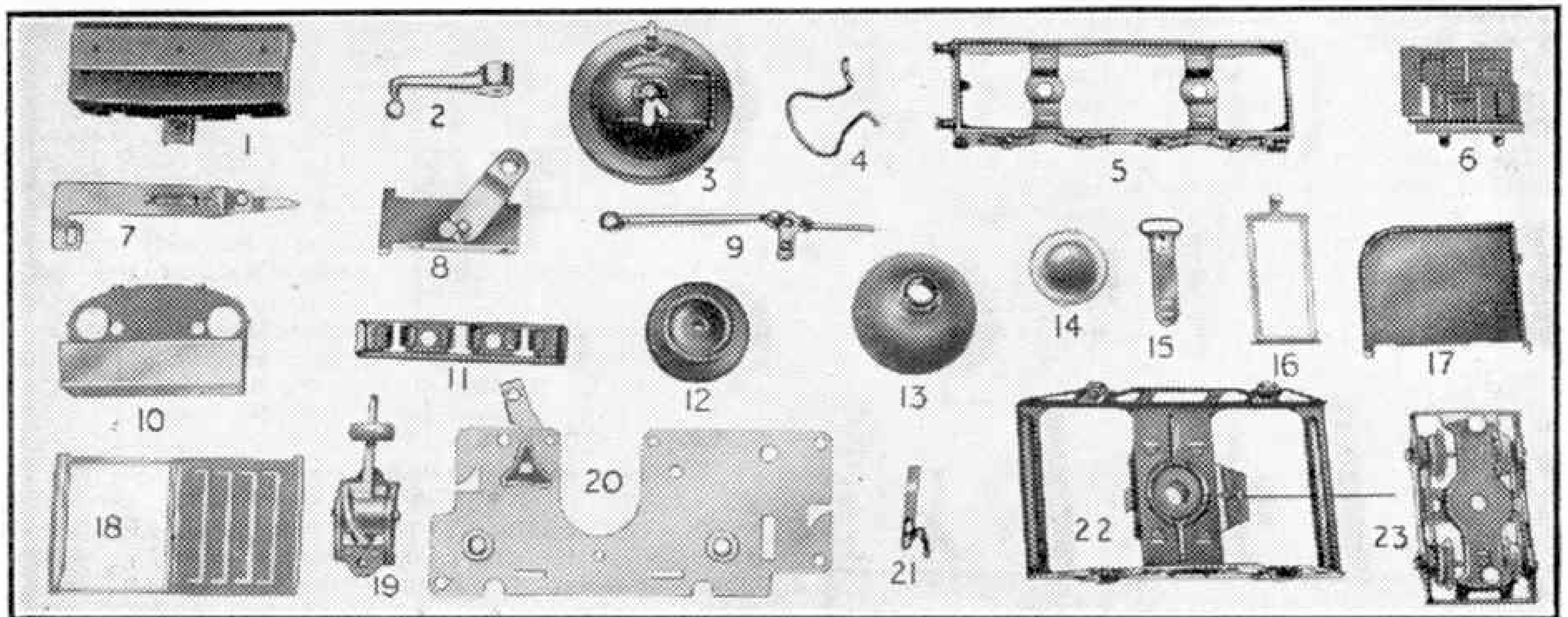
Photographic Competitions

The photographic competition of our advertisers Johnson and Sons Ltd. closes on 30th June. Any kind of photograph is eligible, and the label, or the title panel of a carton of a Johnson's developer, chemical or photographic preparation must accompany each entry. There are 60 prizes, the two first being £5 each. **Prints only** are to be sent to "Competition Department, Johnson and Sons Ltd., Hendon, London N.W.4."

The 7th "David Brown" competition for photographs of a David Brown Tractor at work closes on 30th June. **Negatives only** must be sent to David Brown Tractors Ltd., Meltham, Nr. Huddersfield, and a prize of £3/3/- will be given for the best entry.

Competitions! Open To All Readers

What Train Parts are These?



Our chief competition this month is one for sharp-eyed readers. Above 23 parts of Hornby or Hornby-Dublo locomotives, rolling stock and accessories are illustrated, and all that competitors have to do is to say what each of these parts is.

We expect this competition to be a very popular one. The parts are all easy to trace, and care has been taken in selecting them to make the contest fair to owners of small Hornby or Hornby-Dublo railways. Competitors should bear in mind that even if there are one or two items that they cannot identify, other entrants will be in a similar position, and the list of prizes is a long one, so they should send in their own entries, although these may not be quite complete. Another point to remember is that the

competition is not restricted to Hornby or Hornby-Dublo train owners; every reader of the "M.M." can enter.

When as many of the parts as possible have been identified a list should be made of them in the numerical order shown in our illustration. The competitor's name and address must then be written on the entry, together with his age, and the result forwarded to "Train Parts Contest, Meccano Magazine, Binns Road, Liverpool 13." There are the usual two sections, for Home and Overseas readers respectively, and in each prizes of 21/-, 10/6 and 5/- will be awarded for the best solution. In addition there will be consolation prizes. The closing dates are: Home Section, 30th June; Overseas Section, 31st October.

A Names Puzzle

It is a long time since readers were given a puzzle of the letter square type, so here is a new one that will give them great fun. In the accompanying panel are 90 letters, and these have been so arranged that in them the names of famous aeroplanes and motor cars can be traced. This is done by starting anywhere, and passing at each move to the letter immediately above or below, or to the left or right. Diagonal moves are not allowed. Every letter must be used at least once, but there is no restriction on the number of times a letter can be included in a name.

When as many aeroplanes and motor car names as possible have been found a list of these should be written on a postcard and addressed "Names Puzzle Contest, Meccano Magazine, Binns Road, Liverpool 13." There will be two sections, for Home and Overseas readers, and in each prizes of 21/-, 10/6 and 5/- will be awarded. Even incomplete entries should be sent in, for there will be a number of consolation prizes, and competitors should not forget to write their names and addresses on their entries. The closing date in the Home Section is 30th June; that in the Overseas Section 31st October.

N	A	M	E	N	A	C	I	B	E
O	B	L	N	D	M	O	R	M	R
M	B	L	I	H	A	V	R	U	I
Y	A	L	E	T	E	S	H	F	
O	G	L	O	O	B	R	P	I	T
N	D	A	D	O	N	D	V	E	G
D	I	A	A	N	U	E	R	L	A
A	G	T	N	O	S	D	U	H	N
Y	B	O	R	A	N	O	M	E	D

June Photographic Contest

In this month's photographic contest prizes are offered for the best photograph of any kind submitted. There are two conditions—1, that the photograph must have been taken by the competitor; and 2, that on the back of each print must be stated exactly what the photograph represents. A fancy title may be added if desired. We remind readers that they must not photograph any features of military importance.

Entries will be divided into two sections, A for readers aged 16 years and over, and B for those under 16. They should be addressed "June Photo Contest, Meccano Magazine, Binns Road, Liverpool 13." There will be separate sections for Overseas readers.

In each section prizes of 15/- and 7/6 will be awarded, together with consolation prizes for other good efforts. Closing dates: Home Section 30th June; Overseas Section 31st October.

February Photo Contest Result.—First Prizes, Section A: J. E. Martin, Wickenford; Section B: I. Alexander, Glasgow. Second Prizes, Section A: A. Audsley, Exeter; Section B: A. Newman, Sutton.

Fireside Fun

Doctor: "Get a horse and ride 15 miles a day. The exercise is the best tonic you can have and will cure your loss of appetite."

Scots Patient: "Ay, doctor, but what about the horse's appetite? Could I no cycle instead?"

Inspector: "Did that speeding motorist get across the other day?"

Level Crossing Keeper: "Yes, his widow bought one for him out of the insurance money."

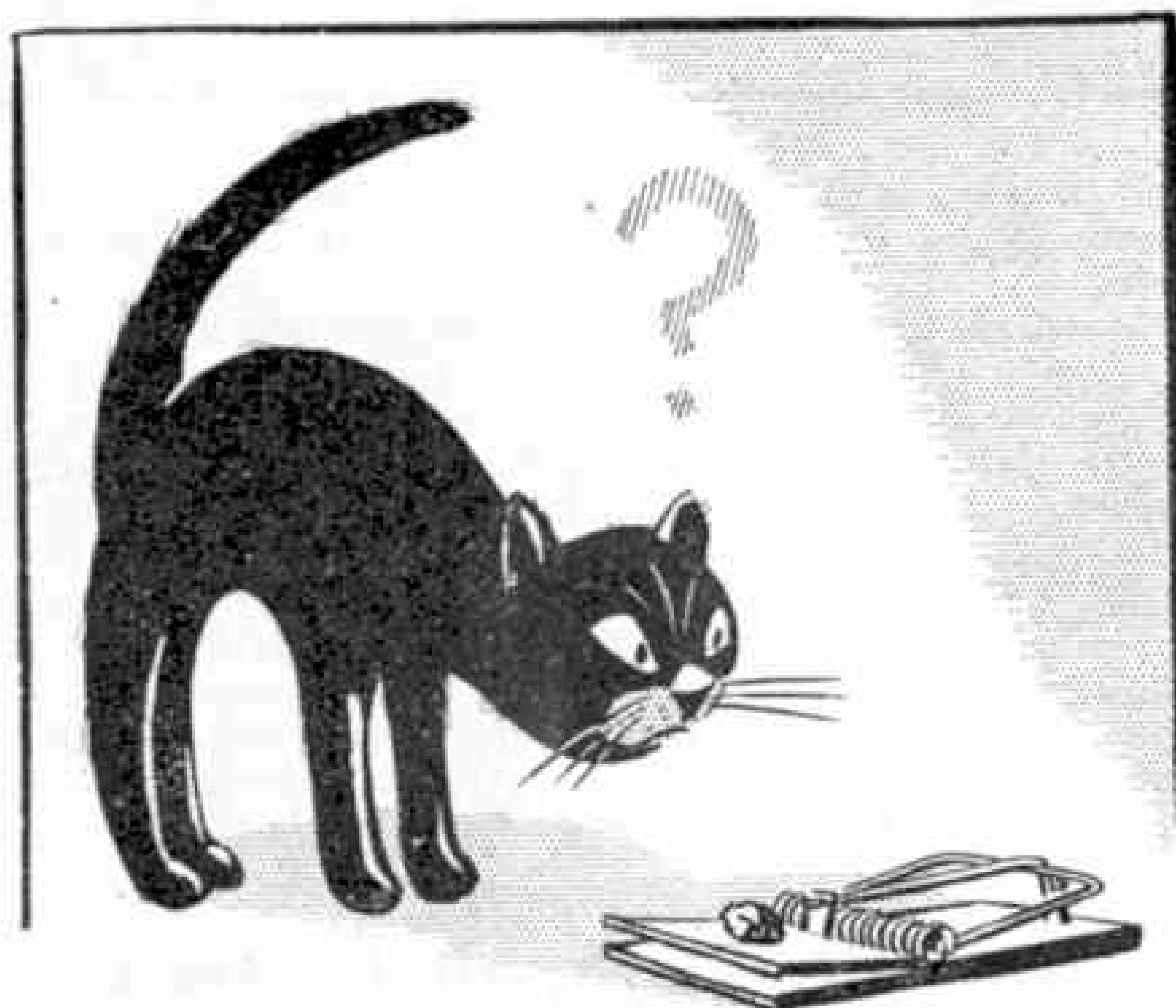
Customer: "That hair restorer you sold me is no good. I haven't grown a single new hair with it."

Barber: "Perhaps not. But you must admit that it has a nice cooling effect when it runs down your neck."

"Which letter of the alphabet is most like an island?"

"I give it up."

"T, because it is in the middle of water."



Family Cat: "I wonder if that is a labour-saving device for my benefit, or whether I am going to lose my job!"

Up in the troop-carrying aeroplane the parachutists were dropping out rapidly, but one hung back.

"Go on, pal," urged the next man. "It's your turn."

"It may be," retorted the laggard, "but there's something wrong here. I really joined as a fire-watcher."

Interfering Old Lady: "A big boy like you could do something better than catching little fish."

Big Boy: "Perhaps so. But this little fish would still be safe if he had kept his mouth shut."

Teacher: "If your father earned £10 a week and gave your mother threequarters, what would she have?"

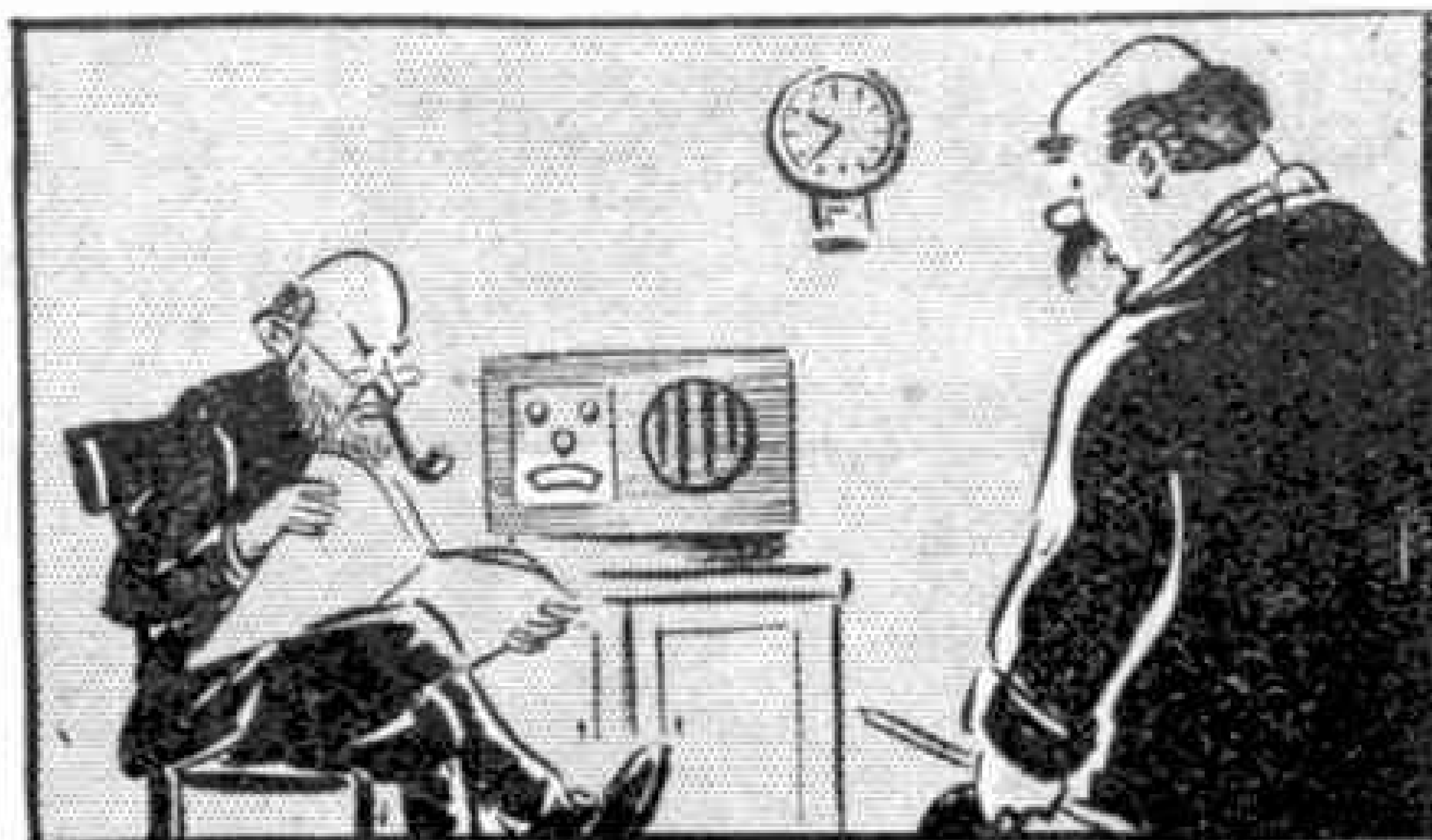
Billy: "A fit."

A boxer was getting severely mauled by his opponent, and was retreating to the ropes. "Hit him, hit him," his second implored repeatedly.

The boxer by this time was so dazed that he clutched at a ring post. "Not with that, idiot," shouted his second. "You'll kill him."

"Why are hen-houses whitewashed?"

"To keep the hens from picking the grain out of the wood."



"And how do you like your radio, Mac?"

"Mon, it's grand, but the wee light's hard to read by!"

Tim was discovered smoking in the powder store.

"Stop that!" cried the foreman angrily. "The last man who did it blew up a dozen men."

"That can't happen here," retorted Tim.

"Why not?"

"Because there are only two of us."

Visitor: "Why don't you try to keep out of prison?"

Prisoner: "I always do, mum, but then I get extra time for resisting and assaulting the police."

"Why on earth don't you put 'Wet Paint' on these railings?" shouted the irate old man who had leaned on them.

"Why, that's just what I am doin', isn't it?" retorted the painter.

"Waiter, is this really ox tail soup?"

"Yes, sir. Is something wrong with it?"

"Well, I've found what looks like a tooth in it."

"That's all right, sir. The ox must have been biting his tail."

Tommy was in tears after his father had given him a good hiding.

"Baby!" remarked his friend. "I don't cry when my father hits me."

"But your father doesn't play the big drum in the band," retorted Tommy sadly.

"What do you know about Przemyśl?"

"It's hard to say."

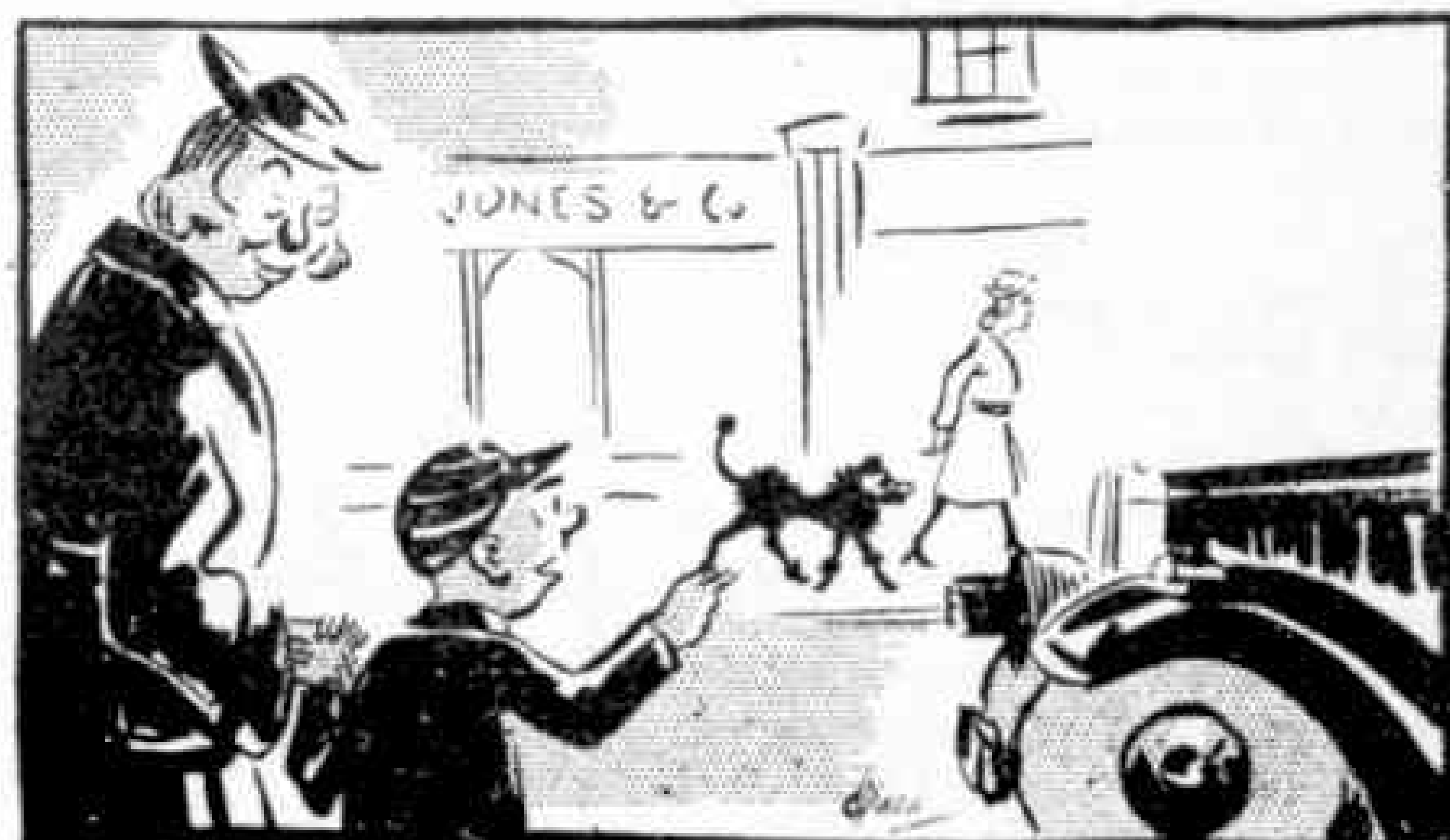
"I knew one man who escaped from a German prison camp and walked over 300 miles to the frontier, living on turnips and carrots pulled up in the fields."

"Poor man! he must have had a terrible time."

"Yes. He said it was as bad as a root march."

"The cat made a lot of noise last night."

"Yes, since he ate the canary he thinks he can sing."



"Look what the moths have done to that poor dog, Auntie!"

Cyclists! WE MUST SAVE RUBBER

HOW TO MAKE YOUR DUNLOP CYCLE TYRES LAST LONGER STILL

INFLATION

Cycle tyres should be inflated hard. If this recommendation is adopted tread wear is reduced to a minimum. The tyre lasts longer, costs you less per mile and the country saves rubber.

FITTING & REMOVING

Carelessness in these operations may cause serious damage to both cover and tube. The use of properly designed levers is strongly recommended. A badly-fitted tyre will wear unevenly and rapidly.

REPAIRS

It is advisable to carry a little solution and a patch or two so that repairs can be effected on the road. Nothing brings about complete destruction of a cycle tyre more quickly than serious under-inflation.

BRAKING

Brakes should be used as gently as possible except in cases of emergency. Fierce braking wears the tread rubber down several times faster than normal use.

OIL

Oil is harmful to rubber, and tyres should, therefore, be kept free from it. Care should be taken to prevent oil from the hub finding its way down the spokes and being absorbed by the rim tape, which of course is in contact with the tube.

VALVE RUBBER

This does not last indefinitely and should, therefore, be tested with a view to replacement if pressure is being lost.

INTERCHANGING

When the tread of the rear wheel tyre shows signs of wear change your tyres over.

MISALIGNMENT

Excessive tread wear results from the wheels running out of line. Feathering of the tread pattern will reveal this condition.

INSPECTION

Inspect the treads of your tyres frequently and remove any embedded stones, etc.



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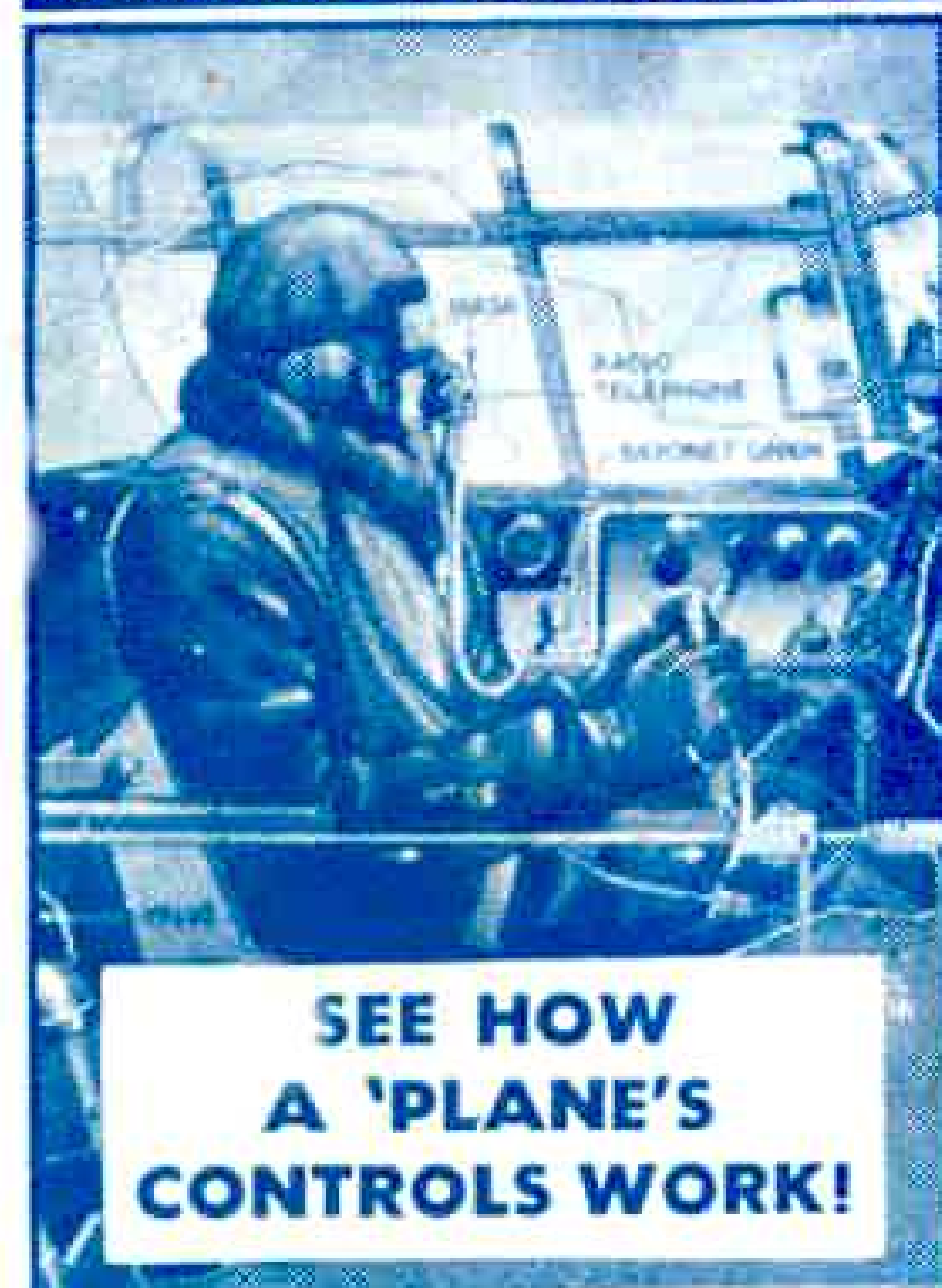


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